Environmental Assessment

for the Implementation of

Wyoming Game and Fish Department's

Proposed Interim Brucellosis Vaccination Program

for Elk on the National Elk Refuge,

Teton County, Wyoming

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Prepared by:
National Elk Refuge
U.S. Fish and Wildlife Service
Region 6

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Abstract:

The Wyoming Game and Fish Department, as per a legal settlement agreement between the United States and the State of Wyoming, proposes to vaccinate calf and cow elk on the National Elk Refuge using Strain 19 beginning in early 2003. Pursuant to the settlement agreement, the U.S. Fish and Wildlife Service will consider the implementation of the proposed program on an short-term basis (until the record of decision is signed for the NER and GTNP bison and elk management plan EIS), and will consider the potential effects described in this environmental assessment, compatibility determination, and biological assessment. The environmental assessment provides an evaluation of the direct and indirect effects of a No Action Alternative and the Proposed Action on wildlife, environmental conditions, recreational opportunities, human health, cultural resources, commercial enterprises, social values and perceptions, and the local economy.

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CHAPTER 1
Introduction

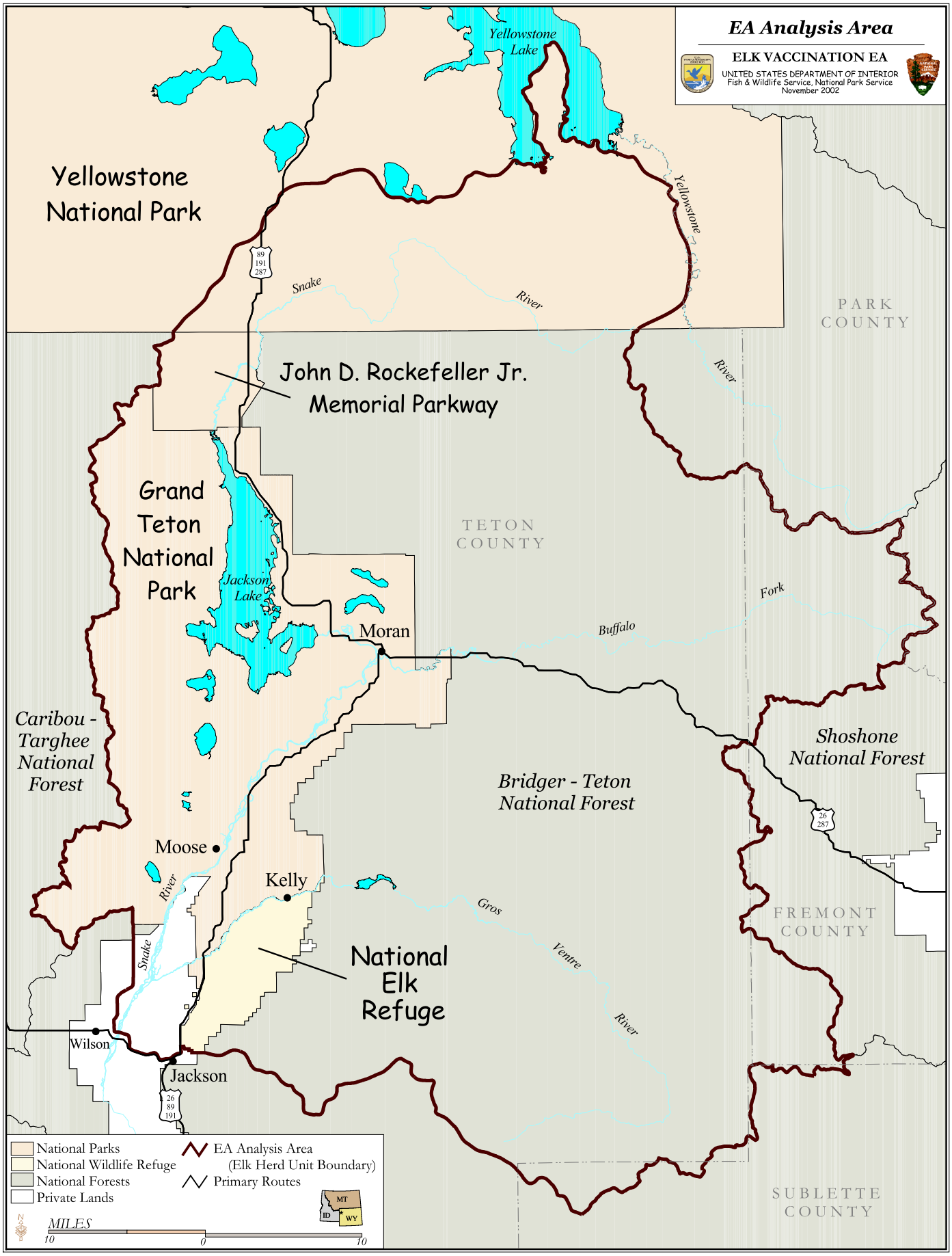
The proposed action would take place on the National Elk Refuge (NER), which is a 24,700-acre unit of the National Wildlife Refuge System (NWRS) administered by the U.S. Fish and Wildlife Service (USFWS). The NER is located just north of the town of Jackson, Wyoming in northwestern Wyoming (Map, next page). The refuge provides winter habitat and supplemental forage for about half of the Jackson elk herd, one of the largest elk herds in the U.S., and it supports nearly all of the Jackson bison herd during many winters. Presently, the Jackson elk herd numbers about 13,500 animals and the Jackson bison herd, which is growing at about 16% each year, currently numbers about 730 animals.

Purpose and Need for Action

This environmental assessment is being carried out pursuant to the settlement agreement entered into between the USFWS and the State of Wyoming in the case entitled *Wyoming v. United States et al.,* Docket No. 98-CV-037B, in which the USFWS agreed to prepare a compatibility determination and complete an environmental assessment concerning Wyoming's proposed elk vaccination program for the NER.

During 1989-1991, the Wyoming Game and Fish Department (WGFD) vaccinated elk for brucellosis on the NER using Strain 19 on an experimental basis, and a total of 2,272 elk were vaccinated. The State of Wyoming requested authorization to commence a brucellosis vaccination program in late 1997 and early 1998. The USFWS declined to permit WGFD to vaccinated elk on the NER because it was felt that the WGFD had not adequately demonstrated the effectiveness of the Strain 19 program and believed that sufficient information did not exist to show that Strain 19 was safe and effective for use on elk. In 1998, the State of Wyoming filed suit against the USFWS, contending that the denial was contrary to the National Wildlife Refuge System Improvement Act (NWRSIA), and that it reduced the efficacy of Wyoming's vaccination program and impinged on what they believed to be their sovereign authority to manage resident wildlife on the NER (Civil No. 98-CV-0037-B).

In August 1999, the U.S. District Court for the District of Wyoming ruled in favor of the federal government on all three counts of the lawsuit and, subsequently (February 2002), the Tenth Circuit Court of Appeals ruled in favor of the federal government on two counts and remanded the third count back to the district court to determine whether, based on the administrative record, the USFWS's decision was arbitrary or capricious. On remand, the Tenth Circuit Court emphasized the need for a timely resolution of the issues involved with the third count that were raised by the State of Wyoming in the lawsuit. Following the remand, the USFWS and State of Wyoming entered into a settlement agreement requiring the USFWS to undertake a compatibility determination and environmental assessment of the State's proposed vaccination program. The settlement agreement did not affect rulings on the first two counts.


EA Analysis Area
ELK VACCINATION EA
UNITED STATES DEPARTMENT OF INTERIOR
Fish & Wildlife Service, National Park Service
November 2002
Yellowstone National Park
Yellowstone Lake
Yellowstone River
Snake River
89
191
287
PARK COUNTY
John D. Rockefeller Jr. Memorial Parkway
Grand Teton National Park
Jackson Lake
TETON COUNTY
Moran
Buffalo Fork River
Caribou - Targhee National Forest
Shoshone National Forest
Bridger - Teton National Forest
26
287
Moose
Kelly
Snake River
Gros Ventre River
FREMONT COUNTY
National Elk Refuge
Wilson
Jackson
26
89
191
SUBLETTE COUNTY
National Parks
National Wildlife Refuge
National Forests
Private Lands
EA Analysis Area
(Elk Herd Unit Boundary)
Primary Routes
MT
ID
WY
MILES
10
0
10

In entering into the agreement, the USFWS and the State of Wyoming agreed that "significant new information exists for the Defendants [USFWS] to consider in determining whether to allow the Plaintiffs [State of Wyoming] to vaccinate elk on the NER." The USGS/Biological Resources Division had completed its multi-year study of using Strain 19 in elk calves (Roffe et al. 2002). The USFWS and National Park Service are evaluating, in their preparation of a bison and elk management plan for the NER and Grand Teton National Park (GTNP), the use of vaccination as a tool for the long-term management of brucellosis. However, in recognition of "the importance of the brucellosis issue to the State and the need for prompt and timely administrative determination of the State's request to carry out its proposed brucellosis vaccination program for elk on the NER," the USFWS agreed "to consider an interim vaccination program considering the significant new information..."

Under the settlement agreement, the State of Wyoming was to "transmit a proposal outlining its interim brucellosis vaccination program for the elk on the NER," and they submitted their proposal on July 8, 2002. Also under the agreement, the USFWS agreed to conduct a compatibility determination under the NWRSIA and to prepare an environmental assessment under the National Environmental Policy Act (NEPA, 42 USC 4371 et seq.).

The WGFD's purpose in proposing the brucellosis vaccination program is to increase coverage and protection of feedground elk in northwestern Wyoming. The WGFD vaccination program currently is carried out annually on 21 WGFD feedgrounds in northwestern Wyoming. Since 1985, approximately 53,000 doses of Strain 19 Brucella vaccine have been ballistically delivered to feedground elk. The NER is only one of two winter feedgrounds in Wyoming where elk are not vaccinated. The WGFD believes that vaccinating elk on the NER will enhance immunity and reduce the risk of transmission of brucellosis by reducing abortions caused by brucellosis.

The need for action is that the elk overwintering on the NER maintain a relatively high prevalence of brucellosis, and this poses a risk to Wyoming's livestock industry and its brucellosis Class-Free status and, from WGFD's perspective, it also poses a risk to the conservation of elk in Jackson Hole. As members of the Greater Yellowstone Interagency Brucellosis Committee, the USFWS and WGFD have committed to address this issue and work toward achieving the committee's goal of protecting and sustaining the existing free-ranging elk and bison populations in the Greater Yellowstone Area and protect the public interests and economic viability of the livestock industry in the States of Idaho, Wyoming, and Montana. The USFWS has adjusted management programs on the NER over time to contribute to the goal, and the WGFD proposal has been designed to further contribute to meeting the goal on the NER.

Decision to Be Made

The decision to be made is whether to allow the implementation of WGFD's interim brucellosis vaccination program for elk while the USFWS and National Park Service complete the bison and elk management plan for the NER and GTNP. Pursuant to Paragraph 3 of the Settlement Agreement entered into with the State of Wyoming, the decision will consider (1) the results of a compatibility determination, pursuant to 50 CFR 26.41, (2) the results of a NEPA review, and (3) consultations under the Endangered Species Act. The decision to be made will not bind the agencies to a similar decision on the NER and GTNP bison and elk management plan.

It is recognized that the WGFD would prefer to evaluate and implement a long-term brucellosis vaccination program for elk on the NER at this time (T. Thorne, Acting Director, WGFD, pers. comm., 2002). However, the USFWS is only evaluating, in this environmental assessment, the implementation of the proposed vaccination program for an interim period (an estimated 3 years), pending the completion of the bison and elk management planning process for the NER and GTNP. The settlement agreement between the USFWS and the State of Wyoming stipulates that the USFWS would evaluate for consideration an interim vaccination program. A long-term vaccination program for the NER, including a continuation of the Proposed Action of this environmental assessment, is being evaluated as part of the bison and elk management planning process for the NER and GTNP.

Legal Mandates Governing the Management of the National Elk Refuge

All national wildlife refuges are required to be managed, first and foremost, to accomplish the purposes for which the refuge was established and the mission of the National Wildlife Refuge System (Refuge System). The mission of the Refuge System "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plan resources and their habitats within the United States for the benefit of present and future generations of Americans" (16 USC 668dd(a)(2)). The USFWS is also required to maintain the biotic integrity, diversity, and environmental health of the Refuge System.

The NER was established in 1912 as a "winter game (elk) reserve" (37 Stat. 293), and this was followed in 1913 with another Act of Congress designating the area as "a winter elk refuge" (37 Stat. 847). Thus, the lands within the NER have primarily been reserved and set apart for the purpose of providing long-term protection to elk winter habitat. Nine years after the NER was established, providing birds with a "refuge and breeding ground" was added as a purpose for which the refuge is to be managed (Exec. Order 3596). This was followed in 1927 by an expansion of the NER for the purpose of providing "for the grazing of, and as a refuge for, American elk and other big game animals" (44 Stat. 1246). These purposes apply to all or most of the lands now within the NER. Several parcels have been added to the NER that have specific purposes associated with their addition to the NER, including the conservation of fish and wildlife, providing opportunities for fish and wildlife-oriented recreation, conservation of threatened and endangered species, and protection of natural resources.

Before any third-party use or activity is initiated on a national wildlife refuge, it must first be determined to be compatible with refuge purposes and the NWRS mission and determined to not be inconsistent with public safety (16 USC 668dd(d)). The regulations describing the process for making compatibility determinations are at 50 CFR 26.41.

In the opinion of the Tenth Circuit Court of Appeals, "While plainly vesting the FWS with authority to administer the Act and the NWRS, the NWRSIA makes numerous mention of the need for cooperation between the FWS and the States to achieve the Act's objectives." The Court added that, "Unquestionably, the NWRSIA inspirits a 'cooperative federalism,' calling for, at a minimum, state involvement and participation in the management of the NWRS as that system affects surrounding state ecosystems." The National Wildlife Refuge System

Improvement Act requires that the USFWS, in preparing comprehensive conservation plans for refuges "...shall, to the maximum extent practicable and consistent with this Act... coordinate the development of the conservation plan or revision with relevant State conservation plans for fish and wildlife and their habitats." The Tenth Circuit Court noted that "Still, the NWRSIA requires the FWS in developing conservation plans for a refuge to act in conformity with State objectives only 'to the extent practical,'" and the NWRSIA adds "...to the extent consistent with [the NWRSIA]."

As further clarification, the Tenth Circuit Court of Appeals explained that "Congress did not intend to displace entirely state regulation and management of wildlife on federal public lands, especially where such regulation and management bears directly upon the well being of state interests arising outside those public lands. In other words, Congress rejected complete preemption of state wildlife regulation within the NWRS. Rather, we believe Congress intended ordinary principles of conflict preemption to apply in cases such as this. That is to say federal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges to the extent the two actually conflict, or where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government."

Related Actions and Plans

The U.S. Department of the Interior initiated the process of developing a bison and elk management plan and environmental impact statement (BEMP EIS) for the NER and GTNP in early 2000. After extensive opportunities for the public to provide input during "prescoping," a notice of intent to prepare an EIS was published in the *Federal Register* on July 18, 2001. This marked the beginning of the NEPA (National Environmental Policy Act) process. One of the issues being addressed in the bison and elk management plan EIS is disease management, including the control of brucellosis. Among other things, the resulting management plan will prescribe a long-term strategy for controlling brucellosis. The decision on the NER and GTNP bison and elk management plan could potentially continue the strategies adopted as a result of this EA process or replace them with another brucellosis management strategy. Other management issues being addressed in the bison and elk management plan EIS include elk and bison population levels on the NER and GTNP, population control measures, forage management, native habitat conservation, and winter feeding. The record of decision (ROD) for the EIS is scheduled to be signed in February 2005.

WGFD annually vaccinates elk with Strain 19 on 21 of the 22 elk feedgrounds that they operate in northwestern Wyoming. From 1985 through 2002, 53,269 elk were vaccinated (Thorne et al. 1997, D. Clause, Brucellosis Biol., WGFD, pers. comm., 2002). When a vaccination program was initiated on each feedground, both calves and cows were vaccinated for the first few years. Because vaccination has been carried out for many years on the feedgrounds, calves are now the primary targets of the program.

WGFD conducted an experimental and limited elk vaccination program on the NER during 1989-1991. A total of 2,272 elk (1,660 calves and 612 cows) were vaccinated during the three winters.

The Greater Yellowstone Interagency Brucellosis Committee (GYIBC) was formed in 1995 in order to coordinate efforts to eliminate brucellosis from elk and bison in the Greater Yellowstone area. A memorandum of understanding was signed by the governors of Idaho, Wyoming, and Montana and the secretaries of the Department of the Interior and Agriculture to form the GYIBC. The goal of GYIBC is to protect and sustain the existing free-ranging elk and bison populations in the Greater Yellowstone Area (GYA) and protect the public interests and economic viability of the livestock industry in the States of Idaho, Wyoming, and Montana. The mission of the GYIBC is to facilitate the development and implementation of brucellosis management plans for elk and bison, and their habitat, in the GYA. In support of the goal and mission are 10 management objectives.

Issues

A variety of issues were considered in the preparation of this environmental assessment. Agency and public comments received during pre-scoping and scoping for the NER and GTNP bison and elk management planning/EIS process were considered, including the issues described in the *Situation Assessment* prepared for the process (U.S. Inst. for Env. Conflict Resolution et al. 2000) and Scoping Report for the BEMP EIS (U.S. Fish and Wildl. Serv. 2002). The following bulleted statements identify potential positive and negative effects of the proposed action and other concerns and opportunities that have been identified with respect to the Strain 19 vaccination of elk on the NER.

<u>Elk</u>

- Potential for brucellosis infections to be lowered, which could result in fewer abortions by cow elk, which ultimately would lead to higher calf production and reduced prevalence of brucellosis.

- Potential for increasing calf production, which would increase recruitment and would increase the elk population, assuming that mortality between birth and adulthood is mostly additive and assuming that harvest strategies do not change.

- Potential increases in displacement or disturbance to elk or higher levels of injury (e.g., calves and cows being gored by bulls, elk being gored by bison) due to adjustments to winter feeding operations or vaccination procedures.

- Potential safety problems with the Strain 19 vaccine.

<u>Other Wildlife (and their Habitat)</u>

- Potential disturbance to bison and displacement of bison from feedlines.

- Potential increases in grazing and browsing pressure on vegetation in the vicinity of feeding areas (e.g., marsh, wet meadow, willow, aspen, and cottonwood habitats), and associated wildlife, due to changes in elk or bison behavior or movements stemming from adjustments to winter feeding operations or vaccination procedures. In addition to being a

NEPA issue, this also is a compatibility issue, as refuge purposes require the NER to provide breeding bird habitat and grazing habitat for big game species.

- Potential adverse impacts of the Strain 19 vaccine on predators, scavengers, threatened or endangered species, or other wildlife (e.g., bio-safety).

Management Issues

- Potential of not vaccinating the targeted number of calves and cows.

- Potential for confounding the results of serological testing.

- Potential effects on the outcome of the ongoing process of preparing the BEMP EIS for the NER and GTNP. Some people are concerned that initiating a vaccination program during the preparation of the BEMP EIS has the potential to influence the outcome of the planning process because they feel that, once a program is established, even a short-term program, it is often difficult to change or eliminate.

Recreation, Commercial, Economics, and Social Values

- Potential increases in the Jackson elk population, which could provide additional hunting opportunities.

- Potential reductions in numbers of sleigh ride trips, educational opportunities for visitors, and in revenue associated with sleigh rides, which could result if adjustments to winter feeding operations or vaccination procedures reduce the amount of time elk spend in the vicinity of feedlines or result in elk leaving the sleigh ride viewing area.

- Potential reductions in elk abortions and infection, which would reduce the potential for transmission to livestock in the Jackson Hole area and which could also reduce transmission among elk and bison (which would further reduce the potential risk of transmission to livestock). The efficacy of Strain 19 (i.e., its effectiveness in reducing brucellosis-induced abortions and infection) is an important issue for some stakeholders.

- Potential to positively affect the local economy by increasing hunting opportunities, and the potential to adversely affect the local economy by reducing sleigh ride trips.

- Potential for adjustments in winter feeding and vaccination procedures to adversely impact the protection of cultural resources.

- Potential to be positively received by people that view brucellosis as a problem and the Strain 19 vaccine as a legitimate procedure in wildlife husbandry, and the potential to be negatively received by people that view brucellosis as not being a problem and that feel there are more effective ways to control brucellosis in elk than vaccinating with Strain 19.

CHAPTER 2
Description of the Alternatives

Two alternatives are evaluated in this chapter: the No Action Alternative and the Proposed Action. The USFWS, in consultation with WGFD, believes the consideration of two alternatives is an appropriate range of alternatives given the short-term nature of an interim vaccination program. Additionally, analysis in Chapter 4 allows the decision maker to select either the No Action Alternative, the Proposed Action, or some action within the range of those two alternatives. Finally, the Proposed Action is in the nature of the request for a determination of whether an action is compatible with refuge purposes, rather than a proposal by the USFWS to address a refuge management problem. In such circumstances, the issue is whether to allow the requested activity, not to create an array of options to meet an identified refuge management need.

NO ACTION ALTERNATIVE

Under existing management of the NER, the two main procedures for mitigating the high seroprevalence of brucellosis caused by concentrating elk at feedgrounds are (1) maximizing standing forage production in cultivated areas to annually delay supplemental feeding as long as possible, and (2) distributing supplemental feed to elk and bison in ways that reduce the disease transmission potential within the herds. These elements of the NER management program are described below.

Forage Production

The total annual average amount of forage produced on NER's 24,700 acres is estimated to be about 21,400 tons, but during the period 1987-2001, it ranged from about 14,500 to 37,000 tons per year. Forage production in cultivated areas would continue to be enhanced above-and-beyond what can naturally be produced, and this would be done for the purpose of maximizing the amount of standing forage. Between 700 and 2,200 acres are flood irrigated each year, depending on water availability. About 60 acres are sprinkler irrigated each year. Cultivated areas would continue to be periodically fertilized, and feeding sites would continue to be harrowed each spring. Cultivated areas would be re-seeded when production begins to decline.

When elk begin to move onto the NER in fall, usually starting in October and November, they forage on native and cultivated grasses throughout the southern one-third of the refuge. Many of the elk that inhabit the NER during the fall and early winter regularly move between the NER and the adjoining Bridger-Teton National Forest. This continues until mid to late winter when supplemental feeding is initiated, at which time elk congregate at the feeding sites. Even after supplemental feeding has been initiated, however, elk disperse out beyond the feedlines each day after the alfalfa pellets have been consumed.

Feeding Operations

Since the NER was established in 1912, supplemental feed has been distributed on the NER in an average of 9 out of 10 years (in 90 years, feeding did not occur in 9 years). Feeding has been carried out every year for the last 20 years. Feeding generally begins in January or early February, but has been initiated as early as December 7 and as late as April 11. Feeding operations generally are concluded in late March or early April, but has been concluded as early as February 12 and as late as April 27. In the years when feeding has occurred, the average duration is about 60 days, but has ranged from 16 to 147 days.

The initiation of feeding would continue to be determined cooperatively between the USFWS and the WGFD, based on the current year's forage production, snow conditions, forage availability, elk numbers, elk distribution, and temperatures (USFWS and WGFD 1974). As in the past, USFWS and WGFD biologists would recommend to the Refuge Manager and WGFD District Wildlife Supervisor when the supplemental feeding program should begin and end each year.

To reduce the potential transmission of brucellosis and other diseases, alfalfa pellets are distributed in four geographically separate areas on the NER, the specific location of feeding is changed daily within each feeding area, the supplemental feed is spread in long serpentine lines, and elk and bison are separated as much as possible.

Elk are fed pelleted alfalfa at the Shop, Poverty Flats, Nowlin, and McBride feeding areas. Daily rations vary with weather conditions but average 7 to 8 pounds of alfalfa pellets per elk per day. Bison are fed at the McBride site in a way that maintains as much segregation between bison and elk as possible, and rations at the McBride site are calculated daily to provide approximately 17 pounds of pellets per bison per day plus the 7-8 pounds of pellets per elk per day. If bison move onto another feeding area, similar procedures are used to maintain as much separation as possible between elk and bison. Counts or estimates of elk and bison are made each day to calculate feed rations for the next day. WGFD pays half the cost of alfalfa pellets.

Elk feeders distribute the alfalfa pellets in long lines to allow all animals access to alfalfa pellets, to minimize aggressive behavior, and to reduce disease transmission. To maximize the length of the feedlines in a given feeding area, several lines of feed (150-300 yards in length) are made parallel to each other, resembling compressed 'S' shapes. Individual lines are typically about 30 yards apart. This is explained in the *Supplemental Feeding Handbook for the National Elk Refuge* (Robbins et al. 1986), which also instructs feed truck drivers to drive as rapidly as the terrain permits and to spread the alfalfa pellets in very thin lines. The combined length of feed lines is determined by the number of elk and the ration level. All of these measures in combination help to spread the elk out, which reduces competition and injuries.

One of the benefits of feeding pelleted hay to elk instead of feeding them long hay, as related to brucellosis management, is that the amount of time that elk are concentrated at the feedlines is minimized. Pelleted feed is ingested and digested more rapidly than long hay. Generally, all of the alfalfa pellets are consumed within 1 to 1½ hours, and after this, elk spread out and begin consuming standing forage.

Monitoring

The WGFD periodically monitors elk on the NER to determine Brucellosis seroprevalence (antibody response to *Brucella*). Winter trapping activities are used to collect blood samples from adult females to determine seroprevalence rates.

Elk are trapped using corral style traps that are permanently or temporarily located on feedgrounds. Currently, there are permanent elk traps on all except 6 of the 23 winter feedgrounds in western Wyoming. The NER has a permanent trap. Elk are baited into the large corral of the trap where a trip wire is located toward the back of the corral. When bumped by an elk, the trip wire closes the main gate. A device called a "bull excluder" is placed across the gate opening to keep branch antlered elk from entering the corral. This is used to eliminate catching non-target animals and reduce the risks of injury to other elk due to goring and trampling. The trap is usually set in the late afternoon and elk typically don't get caught until sometime during the night. The size of catch in these traps may vary greatly, partially due to the size of the corral. The NER has a large trap (corral) and it is possible to catch 100 or more elk in an attempt. The elk are then worked as early as possible the next morning to minimize stress and injury to the animals.

Elk are moved from the corral into a large holding pen, then into a smaller holding pen, and then into the chutes. The NER trap has five chutes. Once the animals are in the chutes, all elk receive a small metal ear tag in both ears. A blood sample of approximately 15 milliliters is collected from all adult females (includes yearling animals). Adult females also receive a neck collar (visibility collar). The animals are then turned loose. Additional blood is drawn from elk trapped on the NER to evaluate pregnancy rates using pregnancy-specific protein B and to screen the herd's exposure to several viral diseases. Occasionally elk are trapped for other reasons, such as research, and are shipped from the trap location.

Seroprevalence is determined using procedures published in *Brucellosis in Cervidae: Uniform Methods and Rules, Effective September 30, 1998* that is published by United States Department of Agriculture – Animal and Plant Health Inspection Service (APHIS 91-45-12). The following four tests are used to determine if an animal is seropositive: (1) Card test, (2) Standard plate agglutination (SPT) test, (3) Complement-fixation (CF) test, and (4) Rivanol test. An animal is considered "seropositive" if either two or more tests react at certain dilution rates or if the CF test alone shows a reaction at a dilution rate of 2+ 1:20 or higher. The criteria used to determine what is called a positive reactor (positive) for the four serology tests is as follows: (1) Card – positive or negative (no dilution), (2) SPT - 1:100 dilution or greater, (3) CF - 2+ 1:20 dilution or greater, (4) Rivanol - 1:25 dilution or greater.

Once serostatus is determined using the four standard tests, another test called cELISA (competitive enzyme-linked immunosorbent assay) is conducted on positive animals to differentiate between Strain 19 vaccine and field strain *Brucella abortus*. Procedures for this test are described in a paper by Van Houten et al. (In Press).

PROPOSED ACTION

The WGFD has proposed to conduct a brucellosis vaccination program for elk on the NER throughout the feeding season. The vaccination program would be conducted in two phases: acclimation and vaccination. If approved, implementation of the proposed action would begin soon after winter feeding is initiated in the winter of 2002-2003. The interim vaccination program would continue until the ROD for the BEMP is signed, at which time direction provided in the BEMP would guide brucellosis management on the NER. Vaccination procedures would be carried out as described below.

Forage Production

No changes would be made to forage production practices, and supplemental feeding would continue to be delayed as long as elk are able to obtain sufficient forage from cultivated and non-cultivated areas.

Feeding Operations

Feeding operations on the NER would not be changed appreciably. To facilitate the vaccination operation, feedlines would be spaced somewhat further apart than currently practiced. Feedlines would be spaced up to 50 yards apart to provide a maximum shooting range of 25-30 yards when the vaccination team drives the over-the-snow vehicle between feedlines. Based on elk behavior that has been observed during feeding operations during the last 20 years, calves cannot be spatially separated from bulls by adjusting feeding operations. In many cases, calves are among the first to appear on feedlines, but bulls also rush to feedlines given their dominant status. Measures to separate age classes could result in increased aggression and injuries to calves. If any adjustments to the feeding protocol are needed to increase the successful vaccination of calves and cows, the USFWS and WGFD would work together to determine the best course of action. No significant changes to feeding operations would be undertaken. Adjustments would not be made that would adversely affect the elk. Long hay would not be used.

The approval of the WGFD's proposal to vaccinate on the NER would not affect the USFWS's decisions, in cooperation with the WGFD, in a given winter related to (1) when to begin winter feeding, (2) how long feeding is conducted (number of days in a given winter), or (3) whether feeding is carried out or not carried out in a given winter.

Vehicle

The WGFD would use a tracked over-the-snow vehicle (LMC 1500 Beartrac or equivalent) to follow feed trucks during feeding operations to acclimate elk and to provide a vehicle from which to administer the vaccine. The WGFD owns one Beartrac vehicle. If WGFD rents a second oversnow vehicle or secures access to another oversnow vehicle, then two teams would vaccinate elk. The WGFD and USFWS would work together in determining the best vehicle to use. The vehicle combination that disrupts feeding operations the least, disturbs elk the least, and provides the most effective platform to shoot from would be used.

Acclimation

Elk would be allowed to become accustomed to normal winter feeding operations that were described in the No Action Alternative. This would allow calves to fully participate in the feeding program as they usually require a week to become accustomed to the feeding equipment and routine.

Beginning soon after the onset of supplemental feeding, WGFD technicians would begin to acclimate elk to the presence of the Beartrac vehicle, the two-person team (one to drive the vehicle and one to vaccinate), the report of an air-gun, and other sounds and actions associated with vaccination. Guns (vaccine and paintball) would be dry-fired at varying velocities to acclimate elk to the report of the gun as the support vehicle passes along the feedlines. Devices that sound similar to the vaccination equipment might be used during initiation of the acclimation period.

At the beginning of the acclimation period, acclimation activities would be carried out while feed trucks are dispensing pellets. Ideally, acclimation activities would be performed at two feeding sites each day. As the animals become accustomed to the presence of the support vehicle, two-person team, and the vaccination guns, the vehicles would spend progressively longer amounts of time in the vicinity of the feedlines and closer to the elk. Detailed notes on elk behavior would be recorded during the acclimation process. The acclimation period could require from several hours up to several weeks. Due to the unknown response of elk, the duration of the acclimation period cannot be predicted at this time. The determination of when to cease the acclimation period and begin vaccinating would be somewhat subjective, but would require elk to remain within 50-75 feet of the support vehicle as it passes along a feedline and occasionally comes to a stop.

Vaccination of Elk

Vaccination would begin when the WGFD determines that elk are sufficiently acclimated to the two-person team, additional vehicle, and discharge of firearms and that elk would remain within 50-75 feet of vehicle holding the two-person team. The protocol for vaccination would mimic that for acclimation of elk except that (1) an air-powered biobullet gun would be used to ballistically inject biobullet containing approximately 5.3×10^9 colony-forming units of freeze-dried Strain 19 vaccine, and (2) an air-powered paintball gun would be used to mark each vaccinated animal with an oil-based paint to ensure that it is not vaccinated more than once.

The support vehicle would continue to be operated the same way it was operated during the acclimation period, which includes occasional stops. Ideally, two vaccination teams would be used so that vaccination could be carried out at two or more feeding sites each day. Vaccination would target juvenile elk at each of the four feeding sites, but would also include adult female elk. Adult cow elk would also be vaccinated to more quickly increase the number of animals in the population that are vaccinated with Strain 19.

During the first few winters of the program, an attempt would be made to vaccinate at least 80% of elk calves, and possibly as many as 50% or more of the adult female elk. This means that approximately 1,200 calves and 2,000 cows (or, a total of about 3,200 elk) would have to be vaccinated each year. The time required to complete vaccination in a given winter cannot be

predicted due to the unknown response of elk on the NER. In 2002, the average vaccination time on state feedgrounds was 20 calves per hour (range: 7-57).

Monitoring

Monitoring would continue to be conducted as it has in the past (No Action Alternative). The USFWS and WGFD would determine a statistically viable sample size and this number of elk would be tested during sample years.

CHAPTER 3
Affected Environment

This chapter provides baseline information about the existing conditions of the resources, opportunities, and other factors that could potentially be affected by the proposed action.

ENVIRONMENTAL SETTING

The National Elk Refuge (NER) occupies about 24,700 acres at elevations between 6,200 and 7,200 feet in the mountain valley of western Wyoming known as Jackson Hole. The valley is bordered by the Teton Mountain Range to the west, the Gros Ventre Range to the east and southeast, and the Snake River Range to the south and southwest. The town of Jackson borders the NER on the south, and the town of Kelly is situated near its northern boundary. Lands to the south and west of the NER are mostly privately owned. East of the NER is the Bridger-Teton National Forest and to the north and northwest is GTNP. Yellowstone National Park, located 40 miles north, does not border the NER but shares migratory and non-stationary resources with the NER. Ecologically, Yellowstone National Park and the other federally managed and private land surrounding and including the NER share many biotic and abiotic elements and are part of a larger area referred to as the Greater Yellowstone Ecosystem.

BIOLOGICAL SETTING

Habitat

The NER encompasses 33 plant community types. Twenty-three of these types are dominated by native plant species naturally occurring on the Refuge and 10 are dominated by cultivated species that were introduced and are perpetuated through agricultural activities. Although some have adapted to natural conditions on the Refuge, most of the cultivated species are supported by flood irrigation.

Feeding Areas

Winter feeding operations on the NER are conducted on three habitat types (Table 1) comprising 10 plant community types. Six of the 10 plant community types are within the cultivated fields habitat type. Feeding operations can also affect vegetation in other habitat types such as riparian and deciduous woodlands and wet meadows that are found near feeding sites.

Table 1. Habitat types located within the four feeding areas on the National Elk Refuge.

Feeding Site	Cultivated Fields	Grassland	Sagebrush
Shop	X	X	
Nowlin	X	X	
Poverty Flats	X	X	X
McBride	X	X	X

Shop Feeding Area - This area consists of cultivated fields and grassland habitat. Cultivated fields include one field that consists almost exclusively of creeping foxtail *(Alopecurus arundinaceus)*, a mixed grass field (primarily smooth brome; *Bromus inermus*), and one newly planted in intermediate wheatgrass (*Elytrigia intermedia*). The only native plant community (a grassland habitat type) is subirrigated bluegrass *(Poa* spp.). A combination of surface irrigation water and subirrigation associated with the seasonally high water table irrigate these areas. Crested wheatgrass is in the process of invading the smooth brome/mixed grass areas in the southern part of the irrigation project area.

Nowlin Feeding Area - This area also consists of cultivated fields and grassland habitat. Most of the cultivated portion of the area is dominated by wheatgrasses with a mixture of other cultivated grasses. Another cultivated field includes intermediate wheatgrass. The remaining acreage remains in subirrigated bluegrass, a native grassland community. The wheatgrass fields are actively flood irrigated while the bluegrass communities receive some irrigation through intentional surface flooding and some subirrigation associated with the seasonally high water table.

Poverty Flats Feeding Area - Most of the feeding in this area is done in a large area characterized as a wheatgrass-bluegrass grassland community. Feeding also is carried out in an area encompassing a wheatgrass-needlegrass (*Stipa* spp.) grassland community, big sagebrush (*Artemesia tridentata*) community, and a cultivated intermediate wheatgrass community. Except for the intermediate wheatgrass field, the area is not irrigated.

McBride Feeding Area - This area consists of two cultivated plant communities, two native grassland communities, and one native sagebrush community. One cultivated field is dominated by Kentucky bluegrass (*Poa pratensis*) and the other is dominated by Russian wildrye (*Elymus juncus*). Native grassland habitat consists of the wheatgrass-bluegrass community and wheatgrass-stipa community. The remaining area is dominated by sagebrush. Cultivated fields are irrigated, but the remaining area is not irrigated.

Areas surrounding the feeding areas can also potentially be affected by any changes in winter feeding operations or responses of elk and bison to vaccination procedures. This is because elk and bison regularly forage in surrounding habitats after alfalfa pellets are consumed each day. Slight changes in feeding operations and the initiation of a vaccination program would not be expected to affect surrounding cultivated fields, grassland, and wetland habitats, as any increases in grazing pressure would occur during the dormant season when snow is covering frozen ground. The following sections describe the communities that have at least some potential of being affected by changes in feeding operations or changes in elk and bison behavior associated with the initiation of a vaccination program.

Deciduous Woody Vegetation

This category includes riparian areas dominated by deciduous trees and shrubs and upland aspen forests. Flat Creek, which is bordered by cottonwood and mixed deciduous shrub plant communities, is located between the McBride and Poverty Flats feeding areas. The canopy is primarily dominated by narrowleaf cottonwood (*Populus angustifolia*), but quaking aspen (*Populus tremuloides*) also is common along some stretches. The understory is primarily dominated by a variety of shrub species, including chokecherry (*Prunus* spp.), serviceberry

(*Amelanchier*), rose (*Rosa spp.*), and snowberry (*Symphoricarpos spp*.). Portions of this riparian area can be heavily used by elk and bison during the winter feeding period, and cottonwood and aspen saplings are absent or nearly absent in the understory.

Upland aspen stands are located to the north of the McBride feeding area in the Gros Ventre Hills. The canopy is dominated by aspen and understories differ depending on a variety of factors, including slope, aspect, amount of time since the last major disturbance, and distance from feedground and extent of herbivory. Shrub species include those found along Flat Creek (see previous paragraph).

Feedgrounds appear to be the focal points of damage to woody plant communities on the Refuge. Monitoring and research results indicate that there is an inverse relationship between the health of shrub and woodland stands and the distance to the nearest feedground (Cole 2000). Understory cover, stem frequency, and height increased with increased distance to the nearest feedground. Anderson (2002) also found that aspen stands more heavily used by elk near feedgrounds were characterized by lower amounts of understory vegetation structure, sucker densities (for suckers taller than 3 feet), and recruitment rates, and by higher amounts of dead and fallen trees. Therefore, aspen stands that have been heavily used by elk are also shrinking in size faster than lesser used stands (Anderson 2002). Cottonwood stands close to the McBride feedground also experience higher snag density and higher down woody debris cover. The number of live trees is declining. Although shrub and woodland stand health improved with increasing distance from feedgrounds, woodland stands are in poor condition refuge-wide as evidenced by low understory height measurements regardless of distance from feedgrounds (Cole 2000). Although some aspen stands in the Gros Ventre Hills have had sufficient recruitment of young aspens to sustain the stands, other stands have minimal or no recruitment due to excessive browsing by ungulates. Some stands are disappearing. The amount of willow habitat on the NER is far less than it was historically, and it continues to decline.

Sagebrush

Near feedgrounds, the dominant species of sagebrush is big sagebrush. Other shrub species that can occur in sagebrush communities include Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), snowberry, wild rose, and serviceberry. Understory grasses include bluegrass species, needle-and-thread grass, wheatgrass species, and smooth brome. Sagebrush communities generally are in good condition, but some impacts have occurred close to feedgrounds, including mechanical damage by feed equipment and browsing and trampling by elk and bison.

Elk Population

The Jackson elk herd is currently estimated to be about 13,500 animals, but has fluctuated in size from an estimated 8,470 to 17,840 during the last 20 years. (These figures are 10% higher than herd counts because computer simulations project that about 10% of the herd is not observed during winter surveys; actual counts ranged from 7,700 to 16,218 during this period) The herd unit occupies an area covering about 2,100 square miles, as defined by WGFD. Segments of the elk herd occupy four relatively distinct summer ranges, including GTNP, southern Yellowstone National Park (YNP), Teton Wilderness Area, and Gros Ventre River valley. The latter two

areas are within the Bridger-Teton National Forest (BTNF). Approximately one-half of the elk wintering on the NER summer in GTNP, another one-quarter summer in southern YNP, and most of the remainder summer on the Bridger-Teton National Forest, in the Teton Wilderness and Gros-Ventre and Spread Creek drainages (Smith and Robbins 1994).

Beginning in October, elk from the GTNP herd segment begin moving onto the NER. Following this movement are animals from the Gros Ventre, Teton Wilderness, and YNP herd segments of the Jackson elk herd. By the end of December, nearly all elk migrating to the NER have completed the migration. Elk begin to arrive on the NER during October and November, and are present on the NER for approximately six months each year.

During the last few winters approximately 6,200 elk have been artificially fed each winter on the NER, but this number has fluctuated from about 5,000 elk in 1984 to about 10,700 in 1997. During the past 20 years, an average of about 7,700 elk has been counted on feedlines on the NER. Herd composition counts are conducted each winter on the NER. On average, about 1,520 bulls, 4,940 cows, and 1,170 calves are counted each winter. During the past 20 years, the number of calves counted on the NER has ranged from about 700 to 1,970 (average = 1,170 or about 15% of the total number of elk classified), and the number of cows counted on the NER has ranged from 2,890 to 7,500 (average = 4,937, or about 65% of the total number of elk classified).

The dispensing of alfalfa pellets during feeding operations is done in a way that results in the least amount of aggression and injuries to animals as possible, while at the same time, allowing these animals access to a sufficient amount of feed each day. It is believed that spreading thin, long, meandering lines of alfalfa pellets is key. Laying feed lines such that successive loops of the feedlines are close to each other allows each individual animal in a large herd access to feedlines in a relatively short amount of time. Also, distributing feed in a short amount of time minimizes competition among animals. A result of this feeding strategy is that all age and sex classes are intermingled along feedlines. After elk have consumed the alfalfa pellets along feedlines each morning, they remain in the vicinity of the feedlines until early afternoon when they begin wandering into areas surrounding feeding sites where they forage on available standing vegetation. Until standing vegetation in the vicinity of feedlines is consumed, they oftentimes do not wander far from the feeding sites. However, this only lasts until standing vegetation is no longer available in the immediate area.

Between 1,200 and 2,500 elk are fed on three feedgrounds in the Gros Ventre River valley, meaning that up to about 80% of the elk in the Jackson herd unit are supplementally fed each winter. An estimated 1,000 to 5,000 elk have annually used native range outside of the NER up through the Gros Ventre and Buffalo River valleys during the last 20 years (an average of 2,984/year). The proportion of the Jackson elk herd that are supplementally fed in a given winter (both at the NER and the WGFD feedgrounds in the Gros Ventre River valley) depends in part on winter severity. When snowfall is particularly heavy, a larger portion of the Jackson Elk Herd can be found wintering on feedgrounds and, conversely, in years of low snowfall, fewer elk move onto feedgrounds.

In spring, elk generally begin migrations to their calving and summer grounds in April and May. Calving begins in May and generally is completed by the end of June. The majority of calving by elk that winter on the NER takes place during the transition between winter and summer

ranges. Most calving occurs in an area bounded by the town of Moose on the south and Two Ocean Lake on the north, and between Leigh Lake on the west and Uhl Hill on the east.

Smith and Robbins (1994) estimated the birth rate in cows wintering on the NER to be an average of 63 calves per 100 cows (yearling and older). This took into account an estimated 7% loss of fetuses due to brucellosis infection, based on work done by Oldemeyer et al. (1993), which assumed a seroprevalence rate of 38%. Because seroprevalence in NER elk has averaged lower than this (an average of 27% in recent years), the estimated 7% loss due to brucellosis may be an overestimate for current conditions (e.g., it may be closer to 5%). When these estimates were made, seroprevalence was higher than present levels and, therefore, losses due to brucellosis infection are likely lower and expected birth rates may be slightly higher. During the last 20 years, calf:cow ratios on the NER have averaged 23.7 per 100 cows. The average calf:cow ratios were slightly lower than this during the last 10 years, with an average of 19.8 calves observed per 100 cows during mid-winter counts on the NER. The difference is largely due to poorer neonatal survival in recent years (Smith et al. In Press).

Brucellosis is an exotic disease in elk that causes a variety of signs ranging from abortion, arthritis, and synovitis, to fatal illness in neonates (Thorne et al. 1978). Assuming the average pregnancy rate and average expected birth rate estimated by Smith and Robbins (1994), about two-thirds of the calves are dying between birth and midwinter. During the early 1990s, Smith and Anderson (1996) estimated neonatal morality (through July 15) to be about 15%. During the late 1990s, estimates of neonatal mortality were nearly double the estimates of the early 1990s, or about 28% (Smith et al. In Press). Most of the mortality was due to predation and most of the predation was done by black bears. Other predators, including grizzly bear and coyotes, contributed to neonatal mortality. Other mortality factors identified in the studies included disease and accidents.

Brucellosis has been present in NER elk since at least 1930 when 3 of 9 elk tested positive and, in the winter of 1935-36, the Wyoming State Veterinary Office found more evidence when 21% of 132 NER elk were seropositive (Murie 1951). Seroprevalence in female elk has varied considerably over the last 30 years (Figure 1). Small sample sizes in some years may be responsible for some of the variability. Since the NER switched to alfalfa pellets in 1975 (27 years ago), the average seroprevalence rate in cow elk has been about 30%. During the last 20 years, seroprevalence in cow elk on

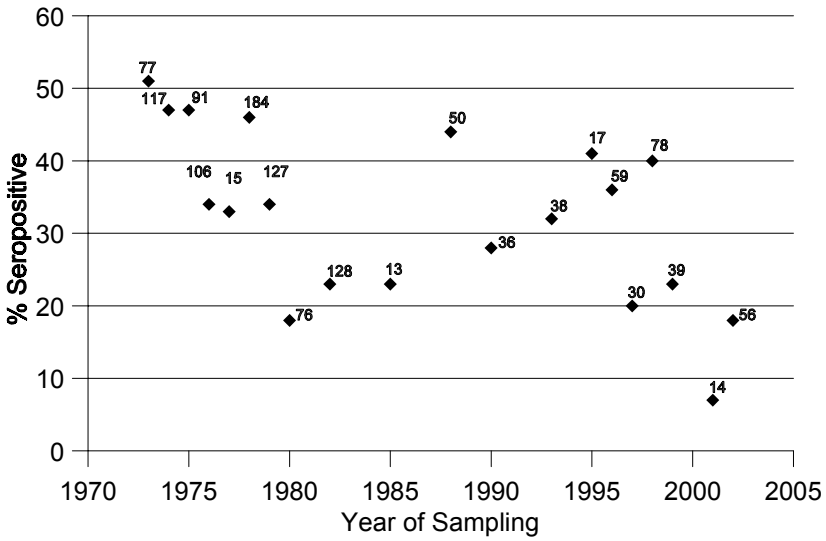


Figure 1. Percent of female elk trapped on the National Elk Refuge that tested positive for brucellosis each year, 1973-2002. The total number of elk tested each year is shown above each data point.

the NER has generally ranged from 20 to 40% and has averaged 28%. From 1989 through 1991, 1,660 calf elk and 612 cow elk were vaccinated with Strain 19 on the NER, or about 4% and 45% of the cows and calves, respectively, on the NER during this period. It is generally agreed that winter feeding in the Greater Yellowstone area sustains the high seroprevalence of brucellosis in elk (Thorne et al. 1978; Smith 1997a,b, as cited in Thorne 2001).

The transmission of brucellosis among elk occurs through the ingestion of food contaminated by fetal fluids or vaginal exudates and by the licking of fetuses fetal materials and vaginal exudates associated with abortions (Thorne et al. 1982). *Brucella* organisms, which can range in concentration from 2.4 of 1×10^8 to 1.4×10^{13} CFU/gram in these materials (Alexander et al. 1981, Thorne 2001), can survive for hours to several months, depending on environmental conditions. Therefore, abortions occurring on feedlines can pose a high risk of exposure.

Elk generally exhibit lower seroprevalence rates than do bison. The National Academy of Sciences (1998) assessed elk transmission risk relative to that of bison. Unlike bison, elk tend to exhibit a "hiding" strategy during the calving period, separating themselves from the herd to calve. Elk also are meticulous at cleaning up afterbirth and soil and vegetation from calving sites. Both of these behaviors appear to contribute to lower seroprevalence rates in elk as compared to bison.

Bison

Currently, there are about 730 bison in the Jackson herd, but the population is growing at about 16% each year, and the population is expected to exceed 1,000 animals in two or three years. The distribution of the Jackson bison herd is entirely within the Jackson elk herd unit. Most bison in the Jackson herd summer on GTNP and most of them winter on the NER In severe winters, the entire Jackson bison population winters on the NER.

After spending the summer on GTNP, bison begin moving southward. Typically, large numbers of bison are present in the Mormon Row-Kelly Hayfields/Hunter-Talbot area throughout September and October, but forays to the NER are not uncommon during this time. The herd uses these areas throughout the fall, and may remain in GTNP through November during some years. Generally, the majority of bison have moved to the NER for the winter by December. At the NER, bison subsist on native winter range and forage produced on irrigated fields until supplemental feeding begins.

Because they are fed a relatively large amount each day at the McBride feeding area (about 17 pounds of alfalfa pellets per day per animal), bison generally do not wander south to other feeding areas on the NER. However, bison also use the Poverty Flats feeding area, where numbers can range from less than 10 up to 200. Bison intermingle with elk at the McBride and Poverty Flats feeding areas, but attempts are made to segregate the two and the majority of bison are fed at a separate location at each feeding area. Separation between elk and bison is maintained because bison out-compete elk on feed lines, can seriously injure elk, and they are segregated as much as possible to reduce disease transmission. The feeding protocol at the McBride feeding area (and at the Poverty Flats feeding area as needed) is to lay out feedlines for bison, then feed is laid out for elk some distance away. Before bison begin moving toward the elk feeding site, additional feed is provided at the bison feeding site. This keeps most, but not all bison segregated from elk during feeding operations. After bison have consumed the alfalfa

pellets along feedlines each morning, they wander around the McBride and middle Flat Creek area foraging on standing vegetation.

After feeding operations are discontinued in late winter or early spring, the bison move to the northern end of the NER and the southern end of GTNP. During late April and May, the herd typically is found in the vicinity of the Kelly Hayfields, Hunter-Talbot area, and Teton Science School, as well as on the northern edge of the NER. Small areas of the BTNF near Shadow Mountain and Ditch Creek are also used occasionally. Much of the Kelly Hayfields and Hunter-Talbot area is composed of previously cultivated agricultural crops (primarily smooth brome and alfalfa). Northward migrations through Antelope Flats and the Snake River bottoms continue to primary summering areas during May and June. Because the majority of calving takes place during the transition between winter and summer ranges, births can happen anywhere from the NER to the northern portions of the summer range in GTNP (GTNP unpublished data).

Williams et al. (1993) found that the seroprevalence of brucellosis in 35 bison killed in the 1989-1990 herd reductions was 77% (with a 95% confidence interval of 64-88%). Seroprevalence in 71 bison harvested during 1999-2001 has ranged from 40 to 70% (average of 55%; D. Clause, Brucellosis Biol., WGFD, pers. comm., 2002). Serology on 26 adult cow bison (1 year or older) during the winter of 2001 on GTNP revealed that 21 of the 26 (81%) were seropositive (Cain et al. 2001).

Other Ungulates

In addition to elk and bison, four other large ungulate species exist in the affected area: pronghorn, mule deer, bighorn sheep, and moose. None of these species use feedlines with elk and bison.

Mule deer are uncommon on the NER during the winter. In the past, mule deer have occurred primarily on Miller Butte, but their numbers have greatly declined since the NER closed an old feed shed that allowed deer access to alfalfa pellets. No deer were seen on Miller Butte during the 2001-2002 winter. In spring, summer, and fall, a small number of mule deer can be found on the northern part of the NER in the Gros Ventre Hills and along the Gros Ventre river. These mule deer may leave this area sooner than weather would dictate due to the beginning of elk hunting season in October.

Bighorn sheep distribution during winter on the NER is confined to the eastern side of Miller Butte and in the vicinity of Curtis Canyon adjacent to the eastern side of the NER . As many as 55 sheep have been observed during previous winters on the NER. They do not appear to be affected by feeding operations on the NER, and few elk inhabit the eastern side of Miller Butte once winter feeding commences.

Pronghorn are absent to rare on the NER during winter. As many as 33 antelope have wintered on the NER and on the adjacent slopes of East Gros Ventre Butte, but harsh winter conditions common to Jackson Hole as well as predation by coyotes significantly reduce the number of antelope surviving the winter. During most winters, pronghorn are not observed on the NER.

Moose inhabit the Gros Ventre River drainage and north slopes of the Gros Ventre Hills of the NER during winter and are unaffected by feeding operations to the south.

Predators and Scavengers

Gray Wolves

The NER does not have a resident wolf pack, but it is visited from time to time by the Gros Ventre pack, which inhabits the Gros Ventre drainage in BTNF. The Teton pack, which is comprised of 23 pack members (2002), and the Gros Ventre pack, which consists of 4-5 wolves, inhabit GTNP. The Gros Ventre pack and Soda Butte pack (a pack that inhabitedYellowstone National Park, but is no longer in existence) arrived in the Jackson Hole in the winter of 1998 and for two months spent considerable time hunting on the NER. Since then, wolves have only been seen occasionally on the NER.

Wolves feed on live and dead elk, deer, bison, and smaller mammals. By their large body size and pack social organization, wolves are adapted to feed on large ungulates such as elk, deer and moose, and, to some degree, bison (Mech 1970). Elk are the preferred prey of wolves in all seasons of the year on the NER and in GTNP (pers.comm. Bruce Smith, Biologist NER 2002). The most susceptible are the old and/or sick, and calves, but deep snow can make healthy elk vulnerable to wolf predation.

Coyotes

Several family groups of coyotes live year round on the NER but they increase to nearly 100 as "transients" follow the elk to the refuge in the winter. Coyotes are opportunistic predators that readily feeds on carrion, but also catch a variety of small mammals from mice, squirrels, and rabbits to ungulate fawns and calves. During the winter on the NER, elk and, occasionally, bison carrion is an important part of their diet. Coyotes play a valuable role in the ecosystem by consuming carcasses.

Grizzly and Black Bears

The last time a grizzly bear was observed on the NER was in 1994. However, they are found throughout the Jackson elk herd unit, including the Gros Ventre Wilderness area and other parts of the Gros Ventre River drainage, Teton Wilderness area, southern Yellowstone National Park, and parts of GTNP. In GTNP, grizzly bears typically occur in the north end and near Moran and the Elk Ranch, but they may be found anywhere in the park. There is an estimated minimum of 400-600 grizzly bears in the Greater Yellowstone Area (U.S. Fish and Wildl. Serv. 2000).

Food habits of grizzly bears in the Greater Yellowstone Ecosystem vary greatly from season to season and year to year depending on availability of preferred foods. Grizzly bears are omnivores that have relatively unspecialized digestive systems similar to those of carnivores. Elk carrion is not as important for grizzly bears within the Jackson herd unit as it is in some areas. In Yellowstone National Park for instance, elk and bison carrion is an important food source during the spring thaw (e.g., March through May), when grizzly bears are coming out of their winter dens (Mattson et al. 1991a). However, because elk and bison in the Jackson herds have a low winter mortality rate due to the winter feeding program on the NER and in the Gros Ventre River drainage, elk carrion during the spring thaw is much less important. Many elk that die in the Jackson herd unit during winter do so on the NER and, therefore, their carcasses are in a place where grizzly bears rarely occur (Steve Cain, Biologist, GTNP, pers. comm. 2002). By

mid-May, grizzly bears begin preying on newborn elk calves (Gunther and Renkin 1990). Predation on elk calves continues until mid-July, when most grizzly bears are no longer able to catch calves (Gunther and Renkin 1990), although a few individuals may successfully prey on elk calves all through the summer, and fall seasons. Consumption of elk and other ungulates resumes in the fall when grizzly bears feed on carcasses of ungulates that die during the rut or are killed by hunters, as well as on gut piles left by hunters. They also consume grasses and sedges, biscuit root, dandelion, clover, other plant matter, and insects during the spring, summer, and fall (Mattson et al. 1991a, Mattson et al. 1991b).

Black bears are common in GTNP and the BTNF, but rarely occur on the NER. They are omnivores that inhabit forested areas and feed on nutritious, succulent vegetation (berries, young shoots, tubers, bulbs and nuts) and on grubs, fish, newborn ungulates, and carrion. Elk and bison carrion may occasionally provide valuable protein. They are predators of newborn elk calves, accounting for 8-60% of the mortality in neonates (Schlegal 1976, Smith and Anderson 1996).

Mountain Lions

Mountain lions occur throughout the Greater Yellowstone Ecosystem, including the NER, GTNP, and BTNF. They feed primarily on ungulates, preferably deer, but they can take elk and bighorn sheep. Where deer are scarce, elk can become a large part of their diet. A mountain lion and her three kittens were visible for a couple of months during the winter of 1999, frequenting a cave on Miller Butte on the NER. Mountain lions in the Jackson Hole area may rely more heavily on elk than in other areas of the country due to the large elk herd (pers. comm. Dave Moody, Biologist WGFD 2002).

Avian Scavengers

Although golden eagles and bald eagles are able predators of smaller prey, they can regularly be seen during the winter on the NER scavenging on elk and bison carcasses. As many as 35 bald eagles have been seen at one time at or near elk carcasses on the NER. During winter months, eagles also feed on carrion of other species, waterfowl, fish, and a variety of small and mid-sized mammals. A bald eagle nesting territory occurs on the lower slopes of East Gros Ventre Butte west of and immediately adjacent to the Refuge. These nesting bald eagles, their offspring, and other bald eagles, that migrate here to winter in the valley, can be expected to hunt for fish and waterfowl, and seek ungulate carrion throughout the Refuge/Park and its vicinity.

Common ravens, common crows, and magpies also scavenge on elk and bison carcasses on the NER during the winter.

Birds and Other Wildlife

About 175 species of birds and 48 species of mammals have been observed on the NER, but the chances for all but a few of these species to be affected by the WGFD's proposal would be small. Any changes in elk and bison behavior stemming from the proposed action could potentially affect riparian, deciduous forest, and wet meadow/marsh habitats, which in turn could affect wildlife associated with these habitats. However, because effects relative to impacts that are already occurring would be slight, discussion of wildlife associated with these habitats is brief.

Riparian and Deciduous Forest communities are primarily willow, cottonwood, and aspen communities with an understory of palatable shrubs, such as chokecherry and serviceberry. Typical bird species that nest in these habitats are Lincoln's sparrows, MacGillivray's warblers, orange-crowned warblers, black- headed grosbeaks, and lazuli buntings. Yellow-billed cuckoos, a candidate species that inhabits gallery stands of cottonwoods, have not been observed in the area and the Proposed Action would not affect cottonwood communities that could potentially be occupied by cuckoos. Riparian and deciduous forest habitats are critical as breeding habitat and migration stopovers for 80% of migratory bird species (Krueper 1992). These habitats support high levels of aquatic and terrestrial diversity. They are used extensively for feeding (plants and insects), nesting, shelter, and travel corridors.

The existing impaired conditions in riparian and deciduous forest habitats on the NER have had impacts to bird communities, as demonstrated in recent studies on the NER and surrounding areas. Anderson (2002) found that aspen habitats heavily browsed by elk had species of birds that nest in the understory, fewer species that nest in the overstory, fewer ground-nesting species, and more cavity-nesting species, as compared to stands that have received relatively low browsing pressure from elk. These results are primarily due to a lower level or near absence of understory vegetation, much lower structural diversity, preponderance of mature trees, and higher rates of aspen mortality and decay in heavily browsed stands compared to stands with lower levels of browsing. Anderson and Anderson (2001) found that aspen stands on the NER have low abundances of aspen obligate species such as red-naped sapsuckers and MacGillivray's warblers. Several widespread, habitat specialist species were found to be absent from the NER (Dieni and Anderson 1997). Willow riparian habitat closest to feedgrounds had fewer species of willow-habitat specialists and fewer species that nest in willows (Anderson 2002). This did not include areas where tall willow plants had completely disappeared due to heavy browsing pressure.

Waterfowl and shorebird species present on the NER are diverse and, in most cases, have habitat linked to aquatic features. Waterfowl and greater sandhill cranes typically nest on the ground in marshes and other habitats near water. Nests are often surrounded by water on small islands, beaver dens, or mounds built up of plant material and mud. They are vulnerable to predators because of their location on the ground and they rely on dense vegetation for camouflage or water levels high enough to impede nest predators. Many of the waterfowl species inhabiting the NER feed primarily on plant material, but some consume mollusks, crustaceans, and aquatic insects. Cranes are omnivorous, feeding on insects, roots of aquatic plants, rodents, snails, frogs, snakes, nestling birds, berries and seeds.

Several species of waterfowl (e.g., trumpeter swans, Canada geese, mallards, green-winged teal, gadwalls, American widgeons, common and Barrow's goldeneyes, and common mergansers) are

year-round residents on NER lands, but most waterfowl and shorebird species are seasonal migrants. Trumpeter swans nest successfully and transient fall populations have numbered over 200, including tundra swans. Fall peak populations approach 3,000 and about 200-300 birds over-winter on NER wetlands. Greater sandhill cranes nests in small numbers on the NER and fall concentrations of over 150 birds have been observed on the NER. Elk graze on the cattails, bulrushes, and other marsh vegetation and, therefore, changes in behavior during the winter feeding period could potentially affect nesting habitat.

Threatened, Endangered, and Sensitive Species

Potentially affected species include gray wolves (threatened species), grizzly bears (threatened species), and bald eagles (threatened species) due to their feeding habits associated with elk. Trumpeter swans are presently classified as a Priority 2 Species of Special Concern (SSC) by WGFD, a regionally sensitive species by USFS, and of great interest to the USFWS. However, the minor modifications to winter feeding operations and the initiation of a vaccination program has no potential to affect this species, so it is not addressed further.

Feeding habits of gray wolves, grizzly bears, and bald eagles are summarized in the previous section, Predators and Scavengers. On national wildlife refuges, wolves that are part of the experimental population are considered a threatened species and the full provisions of Section 7 of the Endangered Species Act apply.

A conservation strategy is being developed to guide the recovery and management of grizzly bears in the Greater Yellowstone Area. The management plan applies to the Primary Conservation Area. The Primary Conservation Area contains grizzly bear population centers (areas that are key to the survival of grizzly bears where seasonal or year-long grizzly bear activity, under natural, free-ranging conditions is common), and habitat components needed for the survival and recovery of the species or a segment of its population. The NER is outside of the Primary Conservation Area, but the northern part of GTNP, the entire Teton Wilderness and Yellowstone National Park, and parts of the Gros Ventre River drainage are within the boundary. Therefore, some of the elk vaccinated under the proposed action would migrate to areas within the Primary Conservation Area.

Canada Lynx, a threatened species, are not found on the NER and do not prey on elk and the proposed vaccination program would not affect the factors identified as significant threats to the lynx. Yellow-billed cuckoos, a candidate species, do not occur in the area and areas that they could potentially occupy would not be affected by the Proposed Action. Sage grouse, a species proposed for listing under the Endangered Species Act, occur on the NER, but the proposed vaccination program would not have any affect on sagebrush habitat, nor would it have any direct effects on sage grouse.

SOCIO-ECONOMIC SETTING

Recreational Opportunities Associated with Elk

In 2001, 24,664 visitors went on sleigh rides to observe wintering elk on the NER, 304,987 stopped in at the visitor center, 439,148 visitors used observational facilities such as auto turnouts along the highway, another 2,000 people participated in environmental education activities, and 99,062 people pursued recreational activities on NER lands. Recreation included 2,193 elk hunters, 3,600 anglers, and 93,394 people engaged in miscellaneous recreational activities (including approximately 30,000 people walking, hiking, jogging, and biking on Refuge roads). A large portion of the NER is closed year-round to public use. Exceptions include certain main roads where most vehicular traffic and all foot traffic is confined. Fishing is allowed on lower Flat Creek annually between August 1 and October 31 and throughout regular fishing season on upper Flat Creek.

Viewing

The sleigh ride operation is conducted by a private concessionaire that operates out of the National Museum of Wildlife Art, 3 miles north of Jackson. Uniformed USFWS interpreters ride on most of the sleighs, as a primary objective of the sleigh rides is to provide an educational experience for visitors. The duration of operation is about December 15 through April 1. The dependability of viewing elk in the sleigh area increases after winter feeding begins on the NER and high elk numbers are more consistent. Sleighs operate daily and depart approximately every 20 minutes from 10:00 a.m. until 4:00 p.m.

Horse-drawn sleighs depart from a boarding area across the highway from the art museum and proceed across Flat Creek to areas that are inhabited by elk. Because the elk are not always found in the same location, specific routes taken by the sleighs can vary throughout the day and from day to day. Generally, however, the sleigh ride area is restricted to the vicinity of elk activity and appropriate terrain for sleighs. The sleigh ride touring area is most closely associated with the Nowlin feeding area. Although elk numbers can vary widely early and late in the season, elk numbers in the sleigh ride touring area typically are 500-2,000 animals. On the rare days in which no elk are present in the sleigh ride touring area, usually occurring early or late in the season, sleigh rides may not operate.

Wildlife viewing—including elk viewing—is also important on GTNP, a national park that is visited by over 3 million people each year. In a recent survey, wildlife viewing was the second most-often listed reason for visiting GTNP. About 75% of visitors in this survey identified wildlife viewing as one of the major reasons for visiting the park.

Elk Hunting

Although elk hunting is used primarily as a management tool to help control elk numbers in the Jackson Herd unit, it also provides recreational opportunities to hunters. Hunting is allowed by special refuge-permit only and is confined to the northern portion of the NER during regulation or extended hunting seasons. These hunts are managed in cooperation with WGFD, and every hunter must posses a Wyoming elk license. Every Friday during hunting season, the hunters enter a lottery that is held at the Jackson Rodeo Grounds, to acquire a permit to hunt for two or

three days the following week. The first weekend of the season, usually in October, is a youth hunt confined to hunters between the ages of 12 and 17 years. Bull elk may be taken during the first week. The rest of the season is restricted to cow/calf hunting. From 1982 to 2001 an average of 1,710 permits were issued each season, with an average of 282 elk killed each season. During the last five years, an average of 2,116 permits were issued each season and an average of 312 elk were killed by hunters. In 2001, 2,193 permits were issued and 311 elk were harvested.

Elk are also hunted on GTNP and on the Bridger-Teton National Forest, including the Teton Wilderness area and the Gros Ventre River drainage. In 2000, a total of 6,532 elk hunters hunted in the Jackson elk herd unit, including the NER, and 2,373 elk were harvested. The average number of hunters during 1996-2001 was 8,033 each year, and an average of 2,840 elk were harvested each year. An average total of 54,433 recreation days/year was spent by hunters for an average of 19.5 days/animal harvested/year. As noted in the 2000 Annual Big Game Herd Unit Reports for the Jackson/Pinedale Region (Wyoming Game and Fish Dept. 2001), "The total harvest in the herd has decreased in recent years. Warm dry fall weather conditions and fewer hunters participating in the hunt have impacted the total harvest in this herd."

Livestock and Brucellosis

The risk of transmission of brucellosis from elk to livestock is small, but it is a concern that must be addressed because of the potential impacts to the State of Wyoming (Nat. Park Serv. 2000). As pointed out by the National Academy of Sciences (1998), the risk "...is small, but not zero."

Several measures are taken to reduce the risk of transmission from elk and bison to livestock in GTNP. One of the terms and conditions of all park grazing permits is that all cattle over the age of four months that graze on the park must be vaccinated against brucellosis. Although several GTNP livestock grazing allotments are located within the elk calving area, turn out dates for livestock within these areas are established in part to maintain temporal separation between livestock and calving elk and bison. Turn out dates on most allotments in the elk calving area are between June 1 and July 1, and most abortions and calving in elk have occurred before June 1. Elk calving begins about May 20 and continues throughout June. About 80% of calves are born by June 15. Please refer to additional discussion on brucellosis in the elk section, above.

Human Health

Brucellosis is a zoonotic disease that can infect people exposed to infected tissue or fluids. The disease in humans is called undulant fever, and symptoms include intermittent fever, chills, night sweats, body and joint pain, poor appetite, and weakness. It can be caused by *Brucella abortus*, which is found in cattle, elk, and bison, as well as other species of *Brucella* found in other mammals such as pigs and goats. Infection can also be caused by the Strain 19 vaccine, which contains live bacteria.

The risk of transmission to people is dose-dependent. People generally become infected either through exposure to tissues containing large quantities of *Brucella* organisms, such as infected reproductive tissues, or frequent exposure to tissues or fluids containing smaller quantities of *Brucella* organisms. The vaccination program also introduces the potential for people to become infected with *Brucella* organisms through accidental injection of Strain 19, but there is no documentation of WGFD vaccination teams becoming infected in this way. Transmission from

person to person is unlikely. Prompt and accurate diagnosis is essential for effective treatment of undulant fever. Accurate diagnosis may be complicated because early symptoms are similar to those for several other diseases. Furthermore, many physicians are unfamiliar with the disease because it so rare, due to the near eradication of brucellosis in cattle herds and limited range of brucellosis in elk and bison herds.

Cultural and Historic Resources

Several historical features occurring on NER lands fall under the jurisdiction of the National Historic Preservation Act (NHPA). Prehistoric archeological sites on the NER include roasting pits, tipi rings, and a bison kill site. Among the artifacts that have been discovered are bones from four bison, numerous flakes, choppers, scrapers, and projectile point pieces. Eight archeological sites have been identified on the NER near the Fish Hatchery.

The Miller House (48TE903), a homesteader's cabin located along the Elk Refuge Road in the southern portion of the Refuge, together with the Miller Barn are the only historic structural resources on the NER and are listed on the National Register of Historical Places under whose regulations and those of the NHPA, state that they must be maintained and preserved.

No known cultural or historic sites exist where elk and bison are currently fed, and most of the ground upon which they are fed was historically cultivated. Some of this land continues to be cultivated.

Social Values and Perspectives

The general public and special interest groups have strongly held divergent values and opinions on the use of vaccines to control brucellosis in free ranging elk and bison populations. As Thorne et al. (1991) observed "Whereas most people regard the GYE (Greater Yellowstone Ecosystem) and its wildlife as a world treasure, because of its reservoir of brucellosis, others regard the GYE as a threat to an important international industry and economy and a black eye to their efforts." The controversy surrounding the preparation of the *Bison Management Plan for the State of Montana and Yellowstone National Park* (Nat. Park Serv. 2000) and the length of time required to complete the NEPA document is testament to this controversy.

Brucellosis and its management has been a major issue in the development of the bison and elk management plan EIS for the NER and GTNP. Opinions have varied widely on whether the relatively high rate of infection being maintained in the Jackson herds is a problem that needs to be addressed. Some people who feel that it is critical to address the issue in a timely fashion contend that the Class-Free status is at risk. Millions of dollars have been spent to eliminate the disease in cattle and, since the only remaining pocket of brucellosis is in elk and bison in the Greater Yellowstone Ecosystem, some people feel that efforts should be made to eliminate the disease in the herds in order to finally eliminate brucellosis from the United States.

Others contend that the risk of brucellosis being transferred from elk and bison to livestock is negligible and that, if cattle are properly vaccinated and steps are taken to maintain separation between wild ungulates and livestock during critical periods (or livestock are removed from the Greater Yellowstone Ecosystem), then the risk of transmission would be minimal. Specific to the southern Greater Yellowstone Ecosystem, some people are concerned that present technology requires elk to be fed in order to vaccinate them, and that concentrations that result

from feeding perpetuates high levels of brucellosis infection in elk and puts elk at risk of maintaining more serious diseases. Some of these people have expressed concern that initiating a vaccination program on the NER that relies on winter feeding would make it all the more difficult to make changes to winter feeding in order to provide for the sustainability of the herds.

Some people feel that brucellosis in elk must be addressed because it reduces calf production and they feel that this limits the number of hunting opportunities and number of elk that can be harvested. Others feel that it simply is the agencies' responsibility, as stewards of the land and wildlife resources, to ensure that animals are well cared for. Still others feel that brucellosis is not an ecologically important problem and that it is already difficult enough to keep the elk herd near objective without further increasing the productivity of the herd.

How to manage brucellosis is another issue of debate. Some people contend that the best way to reduce the risk of transmission in elk is to phase out or eliminate winter feeding operations and to allow wintering elk to spread out over the landscape to a larger degree. Others feel that winter feeding is a necessity and a long-standing successful practice, and that the best way to reduce the risk of transmission is to vaccinate elk. For people that agree with or are willing to accept vaccination, efficacy of the vaccine is an important issue. (U.S. Inst. for Env. Conflict Resolution et al. 2000).

Local Economy

The National Elk Refuge plays an active, albeit small, role in the economy of the Town of Jackson and Teton County. The national prominence of this refuge and its proximity to the Town of Jackson insures that many valley visitors either directly or indirectly use the Refuge, but actual dollars generated from the NER are minor. For example, its location along the most heavily traveled highway leading to and from GTNP and YNP and its vast expanses of scenic open space provides a significant visual experience to vehicle drivers and passengers at no direct cost. Also, horse-drawn sleigh rides have become popular with visitors to Jackson Hole, and revenue generated from this activity contributes to the local economy. During the last five years (winters of 1997-1998 through 2001-2002), winter sleigh rides operated on the NER by a private commercial interest have generated a gross annual income ranging from $250,202 to $264,325, for an average of $256,389/year. Of the gross amount, 10 and 7% are provided to the NER and National Wildlife Art Museum, respectively, as operation fees, and another 8.7% is paid to the NER as a maintenance fee. Minus these costs, the sleigh ride contractor has netted $185,772 to 200,305 per year, for an average of $193,463/year. Average daily revenues are $2,374 (gross), $583 (return to the NER and museum), and $1,791 (net amount to contractor). (Nat. Elk Refuge files)

Many hunters come to Jackson Hole in search of elk during fall and early winter hunting seasons. According to the Wyoming Game and Fish Department, the economic return for each elk license sold in Wyoming is $482.50 and the economic return for each elk killed is $1,653. Therefore, the total economic value associated with elk hunting on the NER in 1997 (2,241 permits issued) totaled about $1.08 million, up 39.4% from 1996. The 424 elk harvested on NER lands during the 1997 hunting season generated an additional estimated $496,292. Furthermore, an estimated 50% of the Jackson elk herd winters on the NER and most of the harvest associated with these animals occurs on the Bridger-Teton National Forest, as well as on GTNP.

CHAPTER 4
Effects Analysis

This chapter identifies the direct and indirect effects of the No Action Alternative and Proposed Action on wildlife, environmental conditions, recreational opportunities, human health, cultural resources, commercial enterprises, social values and perceptions, and the local economy. Because the brucellosis vaccination program would be implemented until the record of decision is signed for the BEMP EIS, as outlined in the Proposed Action, the effects analysis in this chapter assumes that the program would be carried out for 3 years. (The anticipated signing of the record of decision for the BEMP EIS is February 2005.) Long-term and cumulative effects of using Strain 19 on the NER are being evaluated in the bison and elk management planning process for the NER and GTNP. The following terms are used in characterizing potential effects of the No Action Alternative and Proposed Action:

Negligible: the effect is at the lower level of detection.
Minor: an effect that is slight, but detectable.
Moderate: an effect that is readily apparent, but not at a high or severe level.
Major: a severe adverse impact or exceptionally beneficial effect.

For longer discussions, a concluding statement is provided that summarizes the effects described in preceding paragrphs.

ENVIRONMENTAL SETTING

The environmental setting would not be affected by the proposed action. Regardless of alternative selected, the resources and jurisdictions identified in the Environmental Setting section of Chapter 3 would remain unchanged.

BIOLOGICAL SETTING

Habitat

No Action Alternative. Feeding operations would continue as they have in the past, at the same locations, and the numbers of elk on the NER and among the different feeding areas would vary as they have in the past. Therefore, nothing in the No Action Alternative would influence habitat in the vicinity of feeding areas any differently than what has occurred in the past.

Proposed Action. Although slight alterations may be made to feeding operations to accommodate the vaccination program (e.g., increasing the distance between feedlines), none of the changes would affect cultivated fields, grasslands, and sagebrush habitat where alfalfa pellets would be distributed and where vaccination procedures would be conducted. At a maximum, negligible, unmeasurable changes would occur to these habitats.

If vaccination activities cause elk to move away from feedlines more than what they would do in the absence of vaccination, a negligible to minor increase in browsing by elk could take

place on the days that elk are disturbed. However, by the end of the feeding season, these potential impacts would be diminished because elk usually consume all or nearly all accessible woody shoots in the vicinity of feedgrounds by the end of the winter feeding season. The condition of woody vegetation close to feedgrounds is already in degraded condition (Anderson 2002, Cole 2002, Dobkin et al. 2002). The negligible increase in elk numbers that could potentially result from the Proposed Action would not measurably increase damage to woody vegetation.

Conclusion. Any disturbances to elk caused by vaccination procedures (see next section) and any changes in feeding operations would not have more than negligible or minor adverse impacts to habitat in the vicinity of feedgrounds.

Elk Population

Behavior and Social Interactions

No Action Alternative. The behavior and social interaction described in Chapter 3 would continue under the No Action Alternative. Elk generally become habituated to feeding operations within several days of the onset of feeding and, once habituated, elk do not react negatively toward the feed trucks or dispensing of pellets (B. Smith, Wildl. Biol., NER, pers. comm. 2002). After they are habituated, elk occasionally become alarmed. Several elk may temporarily leave feedlines for a variety of reasons, mostly associated with interactions between elk, but also if feeding operations do not progress in a manner to which elk are accustomed (B. Smith, Wildl. Biol., NER, pers. comm., 2002). Elk behavior varies from day to day. On most mornings before feeding is initiated, elk are close to where they were fed the day before, which results in less movement and fewer interactions among elk. On Poverty Flats, the location of feeding varies daily and, over the course of several days, feeding sites may be distributed over a large area. The changes require elk to move longer distances to feeding sites and may result in slightly higher levels of interaction as they converge on feedlines (E. Cole, Wildl. Biol., NER, pers. comm., 2002). Gorings by bull elk on feedlines are rare under the existing feeding program, as the feeding program has been fine-tuned over the last 30 years to reduce competition among elk. Under existing conditions, there are an estimated three to four gorings per year that result in substantial injury or death (B. Smith, Wildl. Biol., NER, pers. comm., 2002).

After elk become habituated to feeding operations, generally within a few days, they are not displaced from feedgrounds due to feeding operations. On rare occasions, elk have departed from feedlines during feeding operations due to events that occurred while feeding took place, such as trapping of elk for brucellosis tests, road grading, and a paraglider passing over the NER while elk were being fed (B. Smith and E. Cole, Biologists, NER, pers. comm., 2002). In these situations, elk that left a feeding area either moved out to the marsh for the rest of the day and returned the next day, or they moved to another feeding area the next day. When elk move to another feeding area, NER staff must split the herd that received additional elk and move elk to the feeding area that was vacated the day before. These activities cause additional disturbance to elk and may require more than one day to fully accomplish.

Proposed Action. It is possible that the use of the oversnow vehicle for vaccination purposes and vaccination activities (such as shooting air guns and hitting elk with biobullets) would not result in any noticeable changes in elk behavior or their use of supplemental feed, but it is anticipated that some changes in elk behavior would be observed. Some alterations in elk behavior would be expected during the acclimation period and during the vaccination period.

As the elk are being acclimated, some elk, especially calves, would show a reluctance to approach the feedlines (B. Smith, Wildl. Biol., NER, pers. comm., 2002). While on the feedlines, it is anticipated that some elk will continue to act nervous. After several days of acclimation, it is expected that elk of all age and sex classes would habituate to the feed trucks, the vehicle used for vaccination procedure, and acclimation activities. If, however, elk do not become habituated and continue to show nervousness and excitability, the acclimation period would continue until elk have become habituated (Chapter 2, Proposed Action). The USFWS and WGFD would meet to determine how to resolve the situation if elk (elk and bison at two feeding areas) are leaving feeding grounds or if other major effects, described above, are occurring.

Elk response to an additional vehicle and the activities associated with vaccination (e.g., starting and stopping of the vaccination vehicle, firing air guns) could vary on a daily basis from negligible effects to moderate or major effects, such as elk leaving the vicinity of the feeding area where vaccination is taking place. Negligible to minor effects would include animals flinching after hearing the report of the air gun or in response to other activities during the acclimation period, small numbers of animals rushing away from the feedline but soon returning to feed, and minor scuffling among elk. These types of effects would be expected to be normal and regular occurrences during both the acclimation and vaccination period. When elk were vaccinated during 1989-1991, small numbers of elk regularly rushed away from the report of the airgun and then soon returned to feeding (J. Griffin, Assistant Refuge Manager, NER, pers. comm., 2002). Despite being habituated to feed trucks, elk on NER feedlines respond to changes in vehicle movements and, therefore, the presence of a second vehicle on the feedgrounds, starting and stopping of the vaccination vehicle could elicit the responses described above.

Occasionally, major, short-duration effects could result from the presence, stopping, and starting of the Beartrac vehicle, human movements on the vehicle, the firing of air guns, and the sight of one or more elk being slightly alarmed in response to these stimuli. Major effects include the movement of large numbers or all animals away from a particular feeding area, escalated aggression among elk resulting in serious injury or death, and aggressive interactions between elk and bison (B. Smith, Wildl. Biol., NER, pers. comm., 2002). Increased aggression could occur if elk from one part of a feedline quickly move away and then converge on another part of the feedline already occupied by elk. To the extent that major, short-duration effects only last for one day or less and to the extent they only happen a small number of times, they would be considered minor effects, especially during the first few days of the acclimation period. If these effects occur, corrective actions would be taken to ensure that major effects do not recur.

The following effects assume that elk have become habituated to vaccination procedures during the acclimation period and vaccination of elk has begun.

The negligible and minor effects listed above, which could also be stimulated by animals being hit with biobullets, would be considered normal and regular occurrences. Although elk would be acclimated to vaccination activities during the acclimation period, major, short-duration effects could potentially occur during the vaccination period. To the extent that major, short-duration effects only last for one day or less and to the extent they only happen a small number of times, they would be considered minor effects. If these effects occur during the vaccination period, immediate corrective actions would be taken to ensure that major effects do not recur. Vaccination teams would monitor and record elk response daily. Likewise feed truck drivers would monitor elk behavior as is standard protocol at the NER. Observations of both groups would be used to make adjustments to avoid major effects. Major effects lasting more than one or two days are not anticipated because changes would be made to the vaccination program, or the vaccination program would be discontinued before impacts reach this level.

These major, short-duration effects may be more pronounced if vaccination activities do not take place every time the feed trucks dispense alfalfa pellets. The predictability of an activity has a large influence on how wildlife responds to it (Knight and Cole 1995). When an activity occurs frequently enough so that it is "expected" and if it is nonthreatening or noninjurious, wildlife become accustomed to it and show little outward response. To the extent that vaccination activities occur daily at particular feeding areas, acclimation would be more effective. If, on the other hand, vaccination only occurs once out of every two to three days (dependent upon whether there are one or two vaccination teams), elk may less readily become accustomed to the activity. Furthermore, it is possible that cumulative disturbance at a particular feeding area might cause elk to abandon that feedground (E. Cole, Wildl. Biol., NER, pers. comm., 2002).

It is not anticipated that additional time would be added to the process of dispensing alfalfa pellets. This is because substantial increases in the amount of time it takes to dispense alfalfa pellets result in increased aggression among elk, which could escalate to major, short-duration effects such as fighting among some elk (B. Smith, Wildl. Biol., NER pers. comm., 2002). Such fighting could potentially lead to injuries or death. Under no situations would the feeding time be extended to a point where elk begin to show increased aggression.

Conclusion: Although it is possible that few differences would be noticed in elk behavior and interactions as compared to the No Action Alternative, it is more likely that elk would generally be more nervous and would move away from feedlines temporarily more often than they do under the existing management scenario, and elk movements between feeding areas could slightly increase. However, major recurring or long-lasting impacts would not be anticipated because a contingency of this environmental assessment and compatibility determination is that changes would be made immediately to the vaccination program to avoid this level of impact. While it is not anticipated that impacts would become major impacts, the vaccination program would cease prior to this if changes are not successful in remedying the impacts.

Brucellosis

No Action Alternative. Seroprevalence would continue to vary over time as it has in the past (Figure 1) and would remain fairly high. Although brucellosis would continue to reduce elk

calf production (by less than 7%; see Chapter 3 discussion), the primary concern is the potential for transmission of brucellosis from elk to livestock (Smith and Robbins 1994, Smith 2001, Ragan 2002, and Thorne et al. 2002). While brucellosis may not be a significant problem ecologically to elk wintering on the NER, the high prevalence of brucellosis in NER elk is an indicator that the conditions experienced by these elk are optimum for the transmission of other, more pathogenic diseases (Smith 2001).

Proposed Action. As noted in the Purpose and Need section, WGFD maintains that they view vaccination as a long-term program and that, even though substantial benefits may not be expected in the short term, benefits would be realized in a long term program. Long-term benefits, however, are not evaluated in this environmental assessment, as it only evaluates the effects of the interim vaccination program (e.g., 3 years). The long-term effects of using Strain 19 in elk on the NER will be evaluated in the NER and GTNP bison and elk management plan EIS.

Efficacy. Strain 19 would provide some level of protection against brucellosis-induced abortion and infection in elk (Thorne et al., 1981, Herriges et al. 1989, Roffe et al. 2002) and could potentially result in a slight reduction in seroprevalence of brucellosis in NER elk following 3 years of vaccination. Recent research found that Strain 19 was 25% effective in preventing abortions in a clinical trial, in which calves were vaccinated intramuscularly with Strain 19 (at a dose of 4.42×10^9 or 8.58×10^9 colony-forming units) compared to a control group injected with saline solution (Roffe et al. 2002). All elk calves in the study were challenged with a dose of 1×10^7 colony-forming units of pathogenic *Brucella abortus*.

WGFD conducted several clinical trials on the use of Strain 19 *Brucella abortus* in vaccinating cow and calf elk (Thorne et al. 1981, Herriges et al. 1989). Vaccine trials were conducted during 1977-1979 by WGFD using *Burcella abortus* Strain 19 at doses of 6.7×10^{10}, 6.1×10^{10}, 10×10^{10}, 5.4×10^{10} colony-forming-units (Thorne et al. 1981). Vaccinated and control animals were challenged with a dose of 7.5×10^7 colony-forming units at different time intervals (38 or 45 days, or 47, 54, or 108 weeks). Additional vaccine trials were conducted during 1981-1988 by WGFD using doses of 3.6×10^7 to 7.6×10^9 colony-forming (Herriges et al. 1989), which is a reduced dose as compared to doses used in 1977-1979. Results among trials were variable, with measured efficacy in individual trials ranging from 7% to 58%. The combined results of WGFD trials involving different doses of Strain 19 and different timing of challenge doses suggest that Strain 19 may provide protection against abortion in 30% of successfully vaccinated cow elk when they are exposed to *Brucella* organisms in the field at doses that do not significantly exceed 7.5×10^7 colony-forming units.

Although an estimated 30% efficacy of Strain 19 in cow elk (Thorne et al. 1981, Herriges et al. 1989) is similar to the estimated 25% efficacy of Strain 19 in calf elk (Roffe et al. 2002), several reports question the validity of the results of vaccination trials conducted by WGFD (previous paragraph) based primarily on flaws in scientific method (Smith and Roffe 1997, Adams et al. 1998, Burnham et al. 1998, Garton 1998).

Although clinical trials show that Strain 19 has a measured efficacy of 25-30%, this efficacy may not be realized under field conditions on the NER because attaining that efficacy in a field situation assumes that: (1) all bio-bullets effectively administer the proper dose of

Strain 19 and that trauma associated with the impact of the bullet does not affect efficacy, (2) Strain 19 is administered to calves before they become infected by *Brucella* organisms in the field, and (3) the percent of field exposed elk protected by vaccine (i.e., the protection afforded to field exposed elk that would normally abort in response to whatever dose they receive) is not markedly different from that observed in clinical trials, based on assumptions identified by Roffe et al. (2002) for applying their results to "real world" conditions. To the extent that these assumptions are not met under field conditions, the efficacy of Strain 19 under field conditions would be less than clinical efficacy. For example, depending on exposure doses in field situations, efficacy in these field situations could be higher or lower than what has been found in clinical trials. In the clinical trial conducted by Roffe et al. (2002), pregnant elk were protected against abortion at a level of 25% when they were challenged with a dose of 1×10^7 colony-forming units of pathogenic *Brucella abortus*. In field situations, *Brucella* organisms can range in concentration from 2.4×10^8 to 1.4×10^{13} colony-forming units/gram in infected fetal materials and vaginal exudates associated with live births and abortions (Alexander et al. 1981, Thorne 2001). When abortions occur on feedlines, other elk commonly investigate, and sniff and/or lick aborted fetuses and associated vaginal material (Thorne et al. 1978), meaning that elk can potentially be exposed to doses of *Brucella* organisms at concentrations that are higher than doses used in clinical trials. However, Cook (1999, as cited by Roffe et al. 2002) calculated that a 10 centimeter diameter area of skin contained about 4.1×10^6 organisms and suggested that this amount may be a "realistic field exposure," which is slightly lower than challenge doses in clinical trials. This means that, to the extent that elk are on average exposed to lesser concentrations of *Brucella* organisms than were used as challenge doses in clinical trials, Strain 19 could provide greater protection than measured in clinical trials. As the dose of a challenge increases, the level of protection provided by a vaccine may decline, as the immune system becomes overwhelmed; and, in a clinical trial, this overwhelming response would be noted by having 100% of control animals abort (T. Roffe, USGS, BRD, pers. comm., 2002). Other factors that can affect the extent to which Strain 19 reduces the seroprevalence of brucellosis in NER elk during 2003-2005 include the actual proportion of calves and cows that receive appropriate doses of the vaccine, and the duration of protection offered by the vaccine (Olson and Elzer 2002).

Clinical efficacy of Strain 19 with respect to protecting vaccinated calves against infection has not yet been determined in the study conducted by Roffe et al. (2002), but it is anticipated that it will be less than 25%. A similar level of protection against infection in previously uninfected calves was also reported by Herriges et al. (1989). As with protecting elk against abortion, vaccination does not provide any protection in elk already infected with brucellosis.

Protection Afforded to NER Elk. In addition to vaccine efficacy in the field situation, the level of protection afforded to an elk population depends on several other factors including the number of animals vaccinated and the proportion of previously infected animals. The Proposed Action would seek to vaccinate 80-100% of calves and a minimum of 50% of adult female elk. On WGFD feedgrounds, 98-100% of the calves are vaccinated in a given year in most situations, and the proportion of cows vaccinated (usually only the first 2 years to initially boost the number of protected animals as calfhood vaccination begins) is much more variable, from less than 50% on some feedgrounds to more than 80% on other feedgrounds (D. Clause, Brucellosis Biol., WGFD, pers. comm., 2002). During 1989-1991 program,

approximately 45% of calves and 4% of cows were vaccinated on the NER, but this was an experimental program in part to determine if elk could be effectively vaccinated with Strain 19 vaccine using biobullet delivery (Funding Request to Veterinary Services, 1988). It is anticipated that a higher proportion of calves and cows would be vaccinated under the Proposed Action than were vaccinated during 1989-1991 on the NER, but it may not be possible, on the NER, to attain the high proportions that have been achieved on WGFD feedgrounds due to the marked differences in the feeding operations. On WGFD feedgrounds, feeders pitch hay from horse drawn sleighs where both the feeder and driver are readily seen by elk each day during feeding operations. This contrasts with feeding on the NER which is done through the use of large, diesel feed trucks where the driver is in the cab of the truck and feeding is completed in a shorter amount of time, thereby minimizing the exposure of elk to humans. (Occasionally, however, people ride on the feed trucks for a variety of purposes, which habituates elk to people at close range to some degree.) Furthermore, each WGFD feedground generally overwinters 300-1,200 elk whereas the NER overwinters from 5,000 to nearly 11,000 elk each year (with 500-3,000 elk at each feeding area). The lower level of habituation to humans and the larger number of elk could result in a lower proportion of elk being vaccinated than is accomplished on WGFD feedgrounds (B. Smith, Wildlife Biol., NER, pers. comm., 2002) The targeted number of calves in the proposal reflects a lower rate as compared to what has been accomplished on WGFD feedgrounds. On the other hand, substantially more time would be spent on the NER vaccinating elk than is spent on WGFD feedgrounds. On WGFD feedgrounds, vaccination of all targeted animals can generally be accomplished within 1-2 weeks (D. Clause, Brucellosis Biol., WGFD, pers. comm., 2002).

Based on the preceding information, vaccinating elk on the NER could, depending on how well assumptions are met, result in an estimated 20% of calves and 9-11% of cows being protected against brucellosis induced abortion each year. The estimated 20% protection in calves assuming that (1) 80% of calves are successfully vaccinated and a field efficacy of 25% with respect to protection against abortion (i.e., 0.80 x 0.25 = 0.20), and it also assumes that (2) all bio-bullets effectively administer the proper dose of Strain 19 and that trauma associated with the impact of the bullet does not affect efficacy, (3) Strain 19 is administered to calves before they become infected by *Brucella* organisms in the field, and (4) the percent of field exposed elk protected by vaccine (i.e., the protection afforded to field exposed elk that would normally abort in response to whatever dose they receive) is not markedly different from that observed in clinical trials, based on assumptions identified by Roffe et al. (2002) for applying their results to "real world" conditions.. The estimate 9-11% protection in cows assumes that (1) 50% of all NER cows are successfully vaccinated, (2) 73% of adult cow elk had not been previously exposed to *Brucella* organisms (assuming that 27% of the cows are already infected, based on the 10-year average 27% seroprevalence rate) and (3) a 25-30% efficacy with respect to protection against abortion (0.50 x 0.73 x 0.25 = 0.09; and 0.50 x 0.73 x 0.30 = 0.11), as well as the assumptions identified for calves, except for number 3, which is already taken into account in the calculations. From the perspective of the WGFD (T. Thorne, Acting Director, WGFD, pers. comm., 2002), this level of protection is substantial, considering that a seroprevalence of 38% only reduces calf production by 7% (Oldemeyer 1993).

Seroprevalence. Strain 19 provides some level of protection against abortion and infection, although it is not the only factor that influences changes in seroprevalence rates over time.

Seroprevalence rates on the NER have fluctuated over time (Figure 1) without vaccination, indicating that other factors have been causing seroprevalence rates to increase and decline over time. Fluctuations in seroprevalence of brucellosis also occur in chronically infected cattle herds. Beginning with a population consisting of a high proportion of susceptible cows in a cattle herd, an abortion event could result in an increase in abortions, increase in seroprevalence and more animals becoming resistant to abortions. Subsequent calvings of infected cows, although usually clinically normal, are highly infectious. There may be an another increase in abortions and seroprevalence observed in the herds as heifers from these infected cows abort the first time they are bred or if new immunologically naïve animals are introduced into the herd. This would then be followed by a reduction in abortions over time as a larger proportion of the population becomes resistant, which would lead to fewer animals becoming exposed, and a reduction in seroprevalence and increased susceptibility to future infection. This in turn would increase the chances of a large number of animals becoming infected and seroprevalence rates increasing, repeating the cycle. (Debra Cox, Staff Vet., Brucellosis Progr., APHIS, pers. comm., 2002)

It is not anticipated that seroprevalence of brucellosis on the NER would decline measurably after vaccinating elk for only 3 seasons (D. Clause, Brucellosis Biol., WGFD, pers. comm., 2002). However, under a long-term program, Strain 19 has the potential to reduce seroprevalence over time to levels that would be lower than would occur without the use of Strain 19 (Gross et al. 2002). On 6 WGFD feedgrounds where brucellosis testing occurred before and after vaccination started, seroprevalence in elk averaged 29% prior to vaccination and has averaged 14% since vaccination began (D. Clause, Brucellosis Biol., WGFD, pers. comm., 2002) (this figure does not include the last few years of data for the Greys River feedground when there was a spike in seroprevalence related to a suspected vaccine failure). Although Strain 19 has likely contributed to a lower seroprevalence rate in elk on WGFD feedgrounds, the degree to which it reduces seroprevalence relative to other factors is not known.

Biosafety. The dose of Strain 19 in biobullets would induce few if any abortions when administered to pregnant cow elk. At doses used in earlier WGFD vaccination trials (e.g., "full dose" of 1-2 x 10^{10} colony-forming units), Strain 19 induced abortion in 27% of pregnant elk in WGFD clinical trials on Strain 19 (Thorne et al. 1981). This problem appears to have been remedied by lower doses of vaccine (Thorne et al. 2002). The WGFD uses the lower dose of Strain 19 in their biobullets. No more than negligible adverse effects of Strain 19 on elk, when administered at doses used by WGFD, have not been documented.

Conclusion. The vaccination of elk using Strain 19 during 2003-2005 would have a negligible positive effect on the seroprevalence of brucellosis in elk overwintering on the NER. Even though Strain 19 vaccination would contribute toward lower seroprevalence of brucellosis, it cannot be said with certainty that seroprevalence would decline on the NER as a consequence of vaccinating for a short period of time (e.g., 3 years), given the other factors that also influence seroprevalence rates (i.e., the interplay of factors that cause wide fluctuations in seroprevalence over time shown in Figure 1). This is different than a long-term program, where the use of Strain 19 would contribute to an overall decline in seroprevalence.

Calf Production and Numbers of Elk

No Action Alternative. Under the No Action Alternative, numbers of elk overwintering on the NER and in the Jackson herd unit would continue to fluctuate as they have in the recent past based on many factors that affect their numbers. Nothing in the No Action Alternative would influence numbers of elk any differently than what has occurred in the past. It is assumed that brucellosis in the elk overwintering on the NER would continue to lower calf production by an estimated 4-7%. Oldemeyer et al. (1993) estimated that brucellosis infection resulted in a 7% loss of fetuses when seroprevalence among NER elk was 38%. During the last 20 years, seroprevalence on the NER has averaged about 28%, meaning that a more reasonable estimate of fetus loss due to brucellosis is 5.25%.

Proposed Action. Activities associated with vaccination that could potentially disturb elk (e.g., the additional vehicle, report of the air gun) and potential adjustments to feeding operations are not anticipated to have any direct or indirect effects on elk numbers. At most, effects on numbers of elk would be negligible. Disturbances associated with vaccination activities would not occur at high enough levels to reduce the nutritional status of elk to the point that it jeopardizes their survival. However, it is possible that the incidence of gorings by bull elk or bison could increase slightly above the current level. Even if the proposed vaccination program had the potential to disturb elk to the point that they departed from the NER, measures would be taken immediately to remedy the situation, including the cessation of the vaccination program if adjustments to the program were ineffective.

Although not anticipated, it is possible that a small number of fatalities could result from disturbances described in the previous section and from elk cows and calves being hit with biobullets. Of the 2,272 elk that were vaccinated during 1989-1991, only 2-5 (less than 0.2%) were reported to have died due to complications associated with biobullet vaccination (Wilbrecht 1989, Thorne 1989). It is also not anticipated that the administration of Strain 19 would make elk more susceptible to predation or other causes of mortality, aside from factors described above.

Assuming that 100% of calves and cows have been vaccinated by the third year of the vaccination program and that Strain 19 is 25% effective in elk vaccinated on the NER, it is estimated that up to 10 additional calves would be recruited into the February population that year and up to 34 fewer abortions would occur that year (see the text box on the following page for details). Thorne et al. (1978) and Herriges et al. (1989) reported that 50-70% of cow elk infected with brucellosis lose their first calf. After aborting the first calf, calf production is not affected appreciably (Thorne et al. 2002). This means that the effects of vaccinating elk on the NER during 2003-2005, in terms of impacts on calf production, would occur during 2005-2007, assuming that female elk are first bred at age 2-1/2 and capable of producing their first calf at 3 years of age (Smith and Robbins 1994). An additional 10

calves recruited into the February population each year would have negligible effects on the population (e.g., less than a 0.1% increase each year).

Conclusion: Vaccination of elk during 2003-2005 would have negligible effects on the Jackson elk population. Any increases in mortality due to the vaccination program or changes in feeding operations would at most affect elk numbers to a negligible degree and, if mortality increased at all due to vaccination activities, it would likely be offset by increased calf recruitment.

Genetics

No Action Alternative. Nothing in the No Action Alternative would affect genetics of the Jackson elk herd any differently than what has occurred in the past.

Proposed Action. Given the negligible effects that Strain 19 would have on calf recruitment, vaccinating elk with Strain 19 during 2003-2005 would have negligible, if any, effects on genetics of the Jackson elk herd. In total, it is estimated that fewer than 30 calves that would have been aborted under the No Action Alternative would survive to breeding age.

The following explains how the estimates of increases in calf recruitment and reductions in abortions were derived. These are estimates for comparative purposes only.

Oldemeyer et al. (1993) estimated that brucellosis annually reduces calf production by 7% when seroprevalence was 38% in adult cows. This translates to a 5% reduction in calf production at a seroprevalence rate of 27%, which is the NER average for the last 10 years (5% is a proportional reduction from 7%).

Assuming 25% efficacy of Strain 19 (Roffe et al. 2002) and assuming that all pregnant cow elk had been vaccinated by the third year of the vaccination program, the rate of brucellosis-induced abortions would decline from 5% to 3.75% by the third year because, for every 5 calves that normally would have been aborted, 25% of them would be born alive (see also the assumptions described in the Brucellosis section).

Assuming a pregnancy rate of 68 calves per 100 cows (Smith and Robbins 1994) and 4,030 cows (65% of 6,200 total elk on the NER), an estimated 2,740 calves could potentially be produced each year. If Strain 19 results in 1.25% (5% - 3.75% = 1.25%) more calves being born than would otherwise would have been aborted, this means an additional 34 calves would be born each year (1.25% of 2,740 calves). Assuming a mortality of 70% during the first 8-9 months, an estimated additional 10 calves would survive until February (30% of 34 calves). A 70% mortality rate during this period reflects the difference between the average birth rate of 65 calves per 100 cows (factoring in a 5% loss due to brucellosis effects, as compared to the 68:100 figure above) and the average 21 calves per 100 cows counted during February classification counts on the NER during the last 10 years.

Other Wildlife Species

This section addresses the potential effects of the Proposed Action on wildlife as a group, except when discussing disturbance effects on bison. Addressing wildlife as a group, rather than addressing effects of the Proposed Action on specific categories of wildlife, was done because potential habitat and biosafety effects are similar among groups of species.

Disturbance to Bison

No Action Alternative. Nothing in the No Action Alternative would affect bison on the NER any differently than what has occurred in the past.

Proposed Action. Slight adjustments to winter feeding operations would not affect bison. If an adjustment to feeding operations resulted in negative changes in bison behavior, changes would be reversed.

Vaccination procedures, including the use of an additional vehicle, firing air guns, and the effects this has on elk could result in behavior changes in bison, ranging from negligible to major, short-duration impacts. When calf and cow elk are being vaccinated on feedlines that are also occupied by bison, bison could become startled by the starting and stopping of the vaccination vehicle, report of the air gun, reactions of elk to these factors or to being hit with a biobullet or paintball, or other movements and sounds. It is anticipated that, in most instances, bison that are disturbed would immediately resume feeding. However, it is possible that on occasion the disturbance might elicit a flight response in bison. The most severe response would be for small to large numbers of bison to leave a feeding area temporarily or it is possible that they may move to another feeding area (B. Smith, Wildl. Biol., NER, pers. comm., 2002).

During the last several years, bison on the NER have been approached with a Thiokol (oversnow vehicle) and, because a small number of bison have been ballistically immobilized for research purposes, these bison now appear to associate the Thiokol with danger. Therefore, the approach and presence of the oversnow vehicle for vaccination could result in some bison becoming nervous and moving away. This could potentially add to the acclimation period at the McBride feeding area.

Conclusion. Although it is possible that the Proposed Action would not result in any disturbance effects on bison feeding on feedlines, it is more likely that bison would generally be more nervous and would temporarily move away from feedlines more often, and bison movements between feeding areas could slightly increase. However, major recurring or long-lasting impacts would not be anticipated because a contingency of this environmental assessment and compatibility determination is that changes would be made immediately to the vaccination program to avoid this level of impact. While it is not anticipated that impacts would approach major impacts, the vaccination program on feeding areas where bison are fed would cease prior to this if changes are not successful in remedying the impacts.

Effects due to Habitat Alterations

No Action Alternative. Nothing in the No Action Alternative would affect habitat any differently than what has occurred in the past and, therefore, would not differentially affect wildlife that use potentially affected habitat.

Proposed Action. Because the Proposed Action would likely not result in any measurable or noticeable changes to habitat conditions (see Habitat section, above), no changes in population levels, densities, productivity, or other parameters of ungulate, bird, predator, and

scavenger species would be anticipated due to possibly slight alterations in habitat conditions.

Effects due to Changes in Elk and Bison Distribution and Mortality

No Action Alternative. Nothing in the No Action Alternative would affect wildlife on or off the NER any differently than what has occurred in the past.

Proposed Action. Because the Proposed Action would have negligible lasting effects on elk and bison distribution — the vaccination program would be changed before this happened — any changes in distribution would not be large enough to result in anything more than negligible effects on wildlife species that could be affected by changes in distribution.

As noted in the Elk Population section, vaccination activities and possible adjustments to winter feeding operations could potentially cause elk and/or bison to move from one feeding area to adjoining habitat (temporarily) or to another feeding area. However, changes would be made to the Proposed Action to minimize the extent to which any such disturbances recur. Furthermore, NER staff would immediately move a portion of the animals from the feeding area that gained animals to the feeding area that lost animals (i.e., any changes in distribution would be temporary).

The negligible to minor increase in mortality, due to such things as gorings by bull elk and bison and mortality caused by complications resulting from biobullets, would add to the food base of scavengers such as coyotes, bald and golden eagles, common ravens, common crows, and black-billed magpies. Because the mortality rate on the NER is relatively low (e.g., an average of about 1½%), even a slight increase in elk carcasses would noticeably add to the food base of scavengers. Conversely, the number of aborted fetuses would decline for a period of 3-4 years, but this would be a negligible impact. No lasting measurable effects on scavengers would be anticipated due to potential changes in the mortality rate of elk on the NER.

Likewise, the anticipated negligible increases in calf recruitment and population growth would have no measurable effect on the food base of wolves, grizzly bears, and mountain lions in other parts of the Jackson elk herd unit.

Conclusion. The Proposed Action would have negligible, if any, effects on other wildlife as a consequence of temporary changes in elk and bison distributions, but could have minor effects on scavengers (although no lasting effects on scavenger populations would be anticipated).

Biosafety of Strain 19 in Wildlife other than Elk

No Action Alternative. Because Strain 19 is not currently used on the NER, there are no biosafety concerns at this time.

Proposed Action. Roffe and Olsen (2002:53) noted that "Despite the fact that S19 has been widely used in bison, very little research has been done on biosafety of this vaccine in bison and non-targeted wildlife species. Nevertheless, S19 vaccine was used extensively in calves

and there were no widespread reports of adverse effects from commercial bison producers." In two studies cited by Roffe and Olsen (2002), female bison were vaccinated with Strain 19 "without apparent harm," but it was recognized that safety information in the studies was limited. Strain 19 administered to pregnant adult bison (at a dose of 5.3×10^8 colony-forming units), however, resulted in 58 of 92 pregnant bison aborting their fetuses (Davis et al. 1991).

The above assessments pertain to administering Strain 19 to bison directly, through hand injection, and did not refer to biosafety of Strain 19 when used to vaccinate another species such as elk, whereby bison would have to pick up *Brucella abortus* Strain 19 in the environment after being shed by elk. Strain 19 has not been shown to be shed by elk (T. Thorne, Acting Director, WGFD, pers. comm., 2002). Therefore, there appear to be few biosafety concerns in bison as a consequence of vaccinating NER elk with Strain 19 (Roffe and Olsen 2002).

Cook and Rhyan (2002:63) noted that "No clinical trials have been conducted specifically examining the safety of S19 in non-target wildlife. However, field experience suggests that S19 is safe in many species of non-target wildlife." WGFD (2002) noted that "No disease or other problem attributable to the vaccine was seen in elk or other species," as a result of vaccinating 23,640 elk from 1985 through 1995. Cook and Rhyan (2002) went on to explain that in the 60 years that Strain 19 has been used to vaccinate millions of cattle throughout the United States and, more recently, to vaccinate commercial and national park bison herds, there have been no reports of Strain 19 inducing disease in any wildlife species. Strain 19 has also been used on WGFD feedgrounds for 17 years, and no disease in non-target species have been observed. Species that had the greatest potential of being exposed include coyotes, bears, field rodents, and many scavenging species of birds (Rhyan and Cook 2002). Major scavengers of elk carcasses on the NER include coyotes, bald and golden eagles, common ravens, black-billed magpies, and common crows. Elk carcasses on other lands occupied by NER elk at other times of the year (e.g., GTNP, Bridger-Teton National Forest) can also be scavenged by black and grizzly bears. Predators of elk while on the NER and on other lands after elk leave the NER in spring include black bears and coyotes (predators of newborn calves), grey wolves, and mountain lions.

As noted by Thorne et al. (2001:379), "Forbes et al. (1996) concluded that *B. abortus* infection in moose may be fatal," but as yet there are no reports of wild moose dying of or being infected with brucellosis in the Greater Yellowstone area. Although this and other reports identify adverse impacts associated with *Brucella abortus* in several species of wildlife (Thorne et al. 2001, for examples), they do not address whether there are any added risks by introducing *Brucella abortus* Strain 19. Of relevance to this assessment is not whether *Brucella abortus* has adverse impacts to wildlife other than elk—as it is already prevalent in the Greater Yellowstone area—, but whether *Brucella abortus* Strain 19 has any added biosafety concerns. Strain 19 is used to vaccinate elk on the three WGFD feedgrounds in the Gros Ventre River basin, which are inhabited by wolves and grizzly bears, and no adverse impacts to these species associated with Strain 19 have been reported for the area.

Conclusion. No negative effects of using Strain 19 on elk, bison, and cattle have been documented for other wildlife species.

Threatened, Endangered, and Sensitive Species

No Action Alternative. Nothing in the No Action Alternative would affect threatened, endangered, and sensitive species any differently than what has occurred in the past.

Proposed Action. The effects of the Proposed Action on the threatened and endangered species most likely to be affected (e.g., grey wolves and grizzly bears) have already been described (see the previous section, Other Wildlife Species).

Conclusion. The Proposed Action would have negligible, if any, effects on threatened, endangered, and sensitive species as a consequence of temporary changes in elk and bison distributions and negligible changes in calf recruitment and mortality rates. It also does not appear that there are any substantial biosafety concerns, with respect to threatened and endangered species, in using Strain 19 to vaccinate elk on the NER.

Biological Diversity and Biotic Integrity

No Action Alternative. Nothing in the No Action Alternative would affect biological diversity or biotic integrity on the NER any differently than what has occurred in the past.

Proposed Action. The negligible to minor effects that the Proposed Action would have on elk and other wildlife species would translate to negligible, if any, effects on population sizes, disease prevalence in NER elk, and on habitat use and distribution. Therefore, there would not be any measurable effects on biological diversity or biotic integrity on the NER and surrounding lands.

One exception to this is that vaccinating elk using Strain 19 *Brucella abortus* would increase the prevelance (relative abundance) of this strain of an exotic species in the NER and GTNP area. However, because elk in the Gros Ventre River drainage and areas south of Jackson are being vaccinated annually with Strain 19, this strain of *Brucella aborta* is already prevalent in elk of the Jackson herd unit. In addition, Strain 19 is less virulent than field Strain B. abortus, and the Proposed Action would reduce the presence of the latter exotic strain in the environment (T. Thorne, Acting Director, WGFD, pers. comm., 2002).

SOCIO-ECONOMIC SETTING

Recreational Opportunities Associated with Elk

No Action Alternative. Nothing in the No Action Alternative would affect elk hunting or viewing opportunities on or off of the NER any differently than what has occurred in the past.

Proposed Action. The vaccination of elk would not begin until well after the close of the hunting season for elk on the NER and other hunt areas in the Jackson herd unit. Therefore, any temporary shifts in distribution resulting from vaccination activities would not affect hunter harvest. Short term effects of the vaccine program on calf production and recruitment could have negligible beneficial, if any, effects on hunting opportunities. Because the Jackson elk herd has been over objective since 1987 and may continue to be over objective

during the course of the interim vaccination program, any additional elk added to the population would need to be harvested in order to maintain numbers near the objective of 11,029. Therefore, up to an estimated 10 additional elk may be available for harvest in the Jackson herd unit each year for 3-4 years as a consequence of the Proposed Action. Given an average success rate of 35%, this means that it may be possible for WGFD to issue an additional 28 elk tags each of the years. However, slightly higher hunter participation may not be a valid assumption, as hunter participation has declined somewhat in recent years despite an increase in the number of available tags (WGFD 2001).

Viewing opportunities during most of the year also would not be measurably affected. Up to 10 additional elk each year in the population would not be noticed by the visiting public. Furthermore, to maintain elk near the Jackson elk herd objective, efforts would be made to harvest any additional animals produced by the vaccination program. If elk leave feeding areas and move to the marsh and other areas along the highway, they would be closer to the highway and would be more viewable by passer byers on the days this occurs.

If vaccination activities do not result in elk vacating the Nowlin feeding area, potential effects on NER sleigh rides would be nonexistent to minor, except that (1) vaccination activities at the Nowlin feeding area could provide morning sleigh ride participants an opportunity to be educated about brucellosis in the Greater Yellowstone area and WGFD's brucellosis management program and, conversely, (2) large numbers of calves and cows marked with paint could detract from the viewing experience and photographic opportunities for some people, especially since elk are viewed and photographed at close range from sleighs.

If large numbers or all elk using the Nowlin feeding area vacate the area due to vaccination activities or adjustments to feeding protocol, sleigh ride operations may be halted temporarily or could stop for the day. This would reduce viewing opportunities for people visiting Jackson Hole on that particular day, would result in fewer opportunities for the NER to educate visitors about elk and wildlife conservation, would reduce revenue associated with sleigh rides (see the section on Local Economy for more detail), and would cost the sleigh ride contractor unreimbursed time and salary costs. Assuming that an average of 225 visitors ride the sleighs each day (J. Griffin, Assistant Refuge Manager, NER, pers. comm., 2002), each day that the sleigh rides are not in operation means that an estimated 225 fewer visitors would have the chance to ride the sleighs, view elk at close range, and be educated about elk and wildlife conservation. During the last five years, an average of 24,367 people participated in sleigh rides each winter. If elk are disturbed on feeding areas due to vaccination procedures to the extent that they leave the area, changes would be made to vaccination procedures to decrease or discontinue the disturbance. Therefore, impacts on sleigh ride operations would be minor.

If elk become alarmed on the Nowlin feeding area, due to vaccination activities, while horse-drawn sleighs are in the vicinity of the elk, horses could panic in response, which is a safety issue for visitors.

Conclusion. Most effects of the Proposed Action on recreation opportunities would be nonexistent or negligible. One potential effect that could potentially result from vaccination activities is the dispersal of elk from the Nowlin feeding area, which would have a major,

short-term effect on the sleigh ride operator and potential sleigh ride visitors that otherwise would have participated in the sleigh rides. However, if such impacts occurred, they would only be permitted to happen on small number of occasions.

Livestock Sector

No Action Alternative. Nothing in the No Action Alternative would affect the potential for elk and bison to transmit brucellosis to livestock in Jackson Hole any differently than what has occurred in the past. The relatively high seroprevalence of brucellosis in elk overwintering on the NER and throughout the Greater Yellowstone area would continue to (1) pose a small risk to the livestock industry and (2) would continue to be in conflict with the brucellosis eradication program for livestock (Thorne et al. 2001).

Proposed Action. The interim vaccination program on the NER would have negligible if any short term effects on protecting livestock from the potential transmission of brucellosis from elk and bison to livestock in Jackson Hole for several reasons. Seroprevalence of brucellosis in NER elk would not change more than a negligible amount as a result of the Proposed Action (but this does not make any judgement about long term effects of vaccination with Strain 19). The infection rate in NER elk would not change appreciably after 3 years of vaccination with Strain 19. Although the Strain 19 vaccination program, as proposed, could potentially reduce the number of elk abortions by an estimated 34 abortions each year for 3-4 years, most of these would occur on the NER and not in areas where livestock occur. Furthermore, most calving by cow elk overwintering on the NER takes place when and where cattle are not present (Smith and Robbins 1994).

Human Health

No Action Alternative. Nothing in the No Action Alternative would affect the potential for brucellosis to be transmitted to people any differently than what has occurred in the past.

Proposed Action. The Proposed Action would have negligible, if any, effects on reducing the risk of transmission of brucellosis from elk to humans, as seroprevelance in NER elk would only decline to a negligible degree as a result of the Proposed Action. Although it is a negligible to minor risk, vaccinating large numbers of elk on a number of feeding areas could potentially result in members of the vaccination team or others contracting undulant fever due to mishandling Strain 19 biobullets or airguns loaded with biobullets.

Cultural and Historic Resources

No Action Alternative. Nothing in the No Action Alternative would affect cultural resources or their protection any differently than what has occurred in the past. Feeding operations would continue to operate primarily on areas that have been previously cultivated and have little or no cultural resource in need of protection.

Proposed Action. Under the Proposed Action, feeding operations would continue to be conducted primarily on the same areas where feeding has been conducted in the past. No changes in locations of feeding would be undertaken. Because of this, and because the operation of oversnow vehicle would be limited to the same area where feed trucks dispense

alfalfa pellets, the Proposed Action would not have an increased effect to cultural resources beyond that of the No Action Alternative.

Social Values and Perspectives

No Action Alternative. Many people and organizations that are opposed to vaccination or feel that the risk to livestock is negligible and that the use of Strain 19 on elk is not justified would be satisfied with the selection of the No Action Alternative for implementation.

Proposed Action. Many people and organizations that feel that it is critical to address the brucellosis issue in a timely fashion and that contend that Wyoming's Class-Free status is at risk would be glad to see the Proposed Action implemented. People that are in favor of Strain 19 vaccination because they feel it would increase elk numbers would also be satisfied with the implementation of the Proposed Action.

Local Economy

No Action Alternative. Nothing in the No Action Alternative would affect the NER sleigh ride operator and the local economy any differently than what has occurred in the past.

Proposed Action. Although vaccination activities and possible slight adjustments to winter feeding protocol would not be expected to result in more than negligible effects on elk on the NER, it is possible that elk could vacate feeding areas occasionally. If elk were to leave the Nowlin feeding area and sleigh ride operations for that day are stopped, the gross amount of money brought in by the sleigh ride operator would decline by an estimated $2,374 for that day. The net loss to the operator would be an estimated $1,791/day and an estimated $583 less would go to the NER and National Museum of Wildlife Art. In addition, the operator would also have to pay employee salaries for 3-5 employees without income to cover this cost, which would amount to an estimated $400 per day, and the USFWS would pay salaries of interpretive staff (an estimated $240/day) who provide interpretation to the public on sleighs. In total, this would amount to a loss of a little over $3,000 per day (J. Griffin, Assistant Refuge Manager, NER, pers. comm., 2002). Given the stipulation that changes to the vaccination protocol would be made immediately if any major disturbances to elk occurred due to vaccination activities, it would be anticipated that sleigh ride operations would be closed down on only a minimal number of days. Because closing sleigh ride operations would not be known until the day of the closure and because most sleigh ride participants do not visit Jackson Hole primarily or solely to go on the sleigh ride, short-term closures would not result in any losses to other sectors of the Jackson Hole economy.

With the slight increase in the number of harvestable elk that may result from the Proposed Action, this could potentially translate into as much as a $13,510 increase in revenue to the Jackson Hole economy, based on an increase of 28 hunters and $482.50 of expenditures per hunter (T. Thorne, Acting Director, WGFD, pers. comm., 2002). On the other hand, hunter participation has declined in recent years despite the increase in the number of available tags, as explained previously, and, there may be no gains in revenues. Therefore, at this time, it appears as though potential increases in elk numbers would have slight or no effect on the local economy.

Because any reduction in abortions in brucellosis infected elk would result in reduced opportunity for transmission to cattle and a positive benefit, this would be exceptionally beneficial if only one outbreak in cattle is prevented. However, because the risk of transmission is already small (National Academy of Sciences 1998) and because few if any abortions occur when and where cattle are present (see discussion in Livestock Sector discussion), the small reduction in elk abortions and no measurable change in seroprevalence would result in no any measurable effects on the livestock sector of the local economy.

Conclusion. The Proposed Action would have no effect, or at most a negligible effect, on the economy of Jackson Hole.

Environmental Justice

No Action Alternative. Nothing in the No Action Alternative would affect minority groups any differently than what has occurred in the past.

Proposed Action. Because of the negligible effects (at a maximum) on recreation opportunities, the livestock industry, human health, and the local economy and, no discernable effects on other facets of society, there appear to be no effects that would unduly discriminate against any particular minority group.

OTHER POTENTIAL EFFECTS

WGFD Programs

In preparing comprehensive conservation plans, the USFWS must coordinate their development with State conservation plans (16 USC 668dd(e)(3)).

No Action Alternative. WGFD believes that, by not allowing the WGFD to vaccinate elk using Strain 19 on the NER, the USFWS would hinder the WGFD elk vaccination program for western Wyoming, resulting in the perpetuation of an exotic disease in the Jackson and neighboring elk herds and continued risks to cattle producers.

Proposed Action. The WGFD believes that the initiation of a vaccination program using Strain 19 on the NER would contribute to the success of their elk vaccination program in western Wyoming by enhancing immunity and reducing the risk of transmission of brucellosis by reducing abortions caused by brucellosis. The WGFD stresses that vaccination must be conducted consistently over a long period of time in order for benefits to be realized (D. Clause, Brucellosis Biol., WGFD, pers. comm., 2002). Long-term Strain 19 vaccination of NER elk is viewed by WGFD as a benefit (T. Thorne, Acting Director, WGFD, pers. comm., 2002). The State of Wyoming believes that the expense and effort of undertaking the program on an "interim" basis is beneficial and furthers State wildlife management objectives without any measurable adverse effects on refuge purposes (T. Davidson, Assist. Attorney General, State of Wyoming, pers. com., 2002).

The Proposed Action would have negligible effects on the ability of WGFD to annually meet the Jackson elk herd objective of 11,029. Although vaccination of elk as proposed could

potentially increase the number of elk being recruited into the harvestable population, the increase would not be high enough to add to cause WGFD to change harvest strategies.

Vaccinating elk on the NER with Strain 19 *Brucella abortus* would not confound WGFD's brucellosis monitoring program or the interpretation of past and future data. As noted by WGFD (2002:2), "One problem associated with S19 was that the four standard tests did not differentiate between S19-vaccinated elk and elk exposed to field strain *B. abortus*. A competitive enzyme-linked immunosorbent assay (cELISA) test was validated in cattle in 1991 and then in elk in 2001 to differentiate between S19 vaccinates and field strain."

NER Management Programs

No Action Alternative. Management would continue, unchanged, as a consequence of the No Action Alternative being implemented.

Proposed Action. A stipulation of the WGFD's vaccination program, if implemented, is that it would not require any more than slight adjustments to NER's winter feeding program. Assuming that elk and bison acclimate sufficiently to vaccination activities, there would be no more than a small number of short-term adverse effects on sleigh ride operations and opportunities. Other NER management programs would not be affected. Therefore, aside from additional coordination between NER and WGFD staff (which will require additional time by NER staff) and possibly additional communication between NER staff and the sleigh ride operator, the Proposed Action would not result in more than minor changes to management of the NER.

Consultation and Coordination with Others

Representatives of the USFWS and WGFD met on two occasions in Cheyenne to discuss the preparation of the environmental assessment for WGFD's proposed vaccination program. On September 3, 2002, the USFWS and WGFD agreed to a timeline, discussed changes to the proposal (reflected in this environmental assessment document), established points of contact and roles and responsibilities, and discussed alternatives. After drafting Chapters 1-3 of the environmental assessment, the USFWS sent a review copy to the WGFD on October 4. On October 10, 2002, representatives of the USFWS and WGFD met in Cheyenne to discuss comments on the draft chapters, issues to be addressed in Chapter 4, and to discuss general effects of the proposal. USFWS and WGFD met on two occasions to incorporate WGFD comments into the draft environmental assessment (October 22 and November 5, 2002). Additionally, staff corresponded by telephone and email.

NER staff were involved in the preparation of the environmental assessment, and several staff reviewed various versions of the document (e.g., Refuge Manager, Biologists, Assistant Manager for Outdoor Recreation, Feed Truck Operators). Much of the material for Chapter 3 was obtained from material that had been written for the NER and GTNP bison and elk management plan EIS, and biologists from several agencies had been consulted in compiling this information.

An internal review of the environmental assessment was distributed to USFWS offices (e.g., NER, Regional Office in Denver), WGFD offices (e.g., Jackson/Pinedale office, Cheyenne office), U.S. Geological Survey's Biological Resources Division (Bozeman, Montana) and the Department of the Interior Solicitor's office in Denver on November 12, 2002. Changes were made to the review-version of the environmental assessment based on comments received from these offices.

Participants of the meetings between the USFWS and WGFD.

Participants	Position and Affiliation
September 3, 2002	
John Blankenship	Deputy Regional Director, USFWS
Rick Coleman	Regional Chief, National Wildlife Refuge System, USFWS
Barry Reiswig	Refuge Manager, National Elk Refuge, USFWS
Don DeLong	Project Manager, Bison & Elk Planning Office, USFWS
Tom Thorne	Acting Director, WGFD
Tom Davidson	Assistant Attorney General, State of Wyoming
Scott Smith	Regional Biologist, WGFD
October 10, 2002	
Rick Coleman	Regional Chief, National Wildlife Refuge System, USFWS
Barry Reiswig	Refuge Manager, National Elk Refuge, USFWS
Don DeLong	Project Manager, Bison & Elk Planning Office, USFWS
Tom Thorne	Acting Director, WGFD
Tom Davidson	Assistant Attorney General, State of Wyoming
Dean Clause	Brucellosis Biologist, WGFD
Keith Burron	Associated Legal Group, LLC

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Appendix A

COMPATIBILITY DETERMINATION

(Draft: 12/09/02)

Use: Vaccination of Calf and Cow Elk Using Strain 19 for an Interim Period (an estimated 3 years), by the Wyoming Game and Fish Department

Refuge Name: National Elk Refuge, Teton County, Wyoming

Refuge Purpose(s) and Establishing and Acquisition Authority(ies):

"...the establishment of a winter game (elk) reserve..." 37 Stat. 293, dated Aug. 10, 1912

"For the establishment and maintenance of a winter elk refuge in the State of Wyoming..." 37 Stat. 847, dated March 4, 1913

"... all lands that now are or may hereafter be included within the boundaries of ...the Elk Refuge, Wyoming, ...are hereby further reserved and set apart for the use of the Department of [Interior] as refuges and breeding grounds for birds" Executive Order 3596, dated Dec. 22, 1921

"...for the use of the Secretary of [the Interior] as a refuge and breeding grounds for birds..." Executive Order 3741, dated September 20, 1922

"...for grazing of, and as a refuge for, American elk and other big game animals..." 44 Stat. 1246, dated Feb. 25, 1927

"...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." (Fish and Wildlife Act of 1956)

"...suitable for— (1) incidental fish and wildlife-oriented recreational development. (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 USC 460k-1 (Refuge Recreation Act of 1962)

National Wildlife Refuge System Mission:

The Refuge System Mission is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

The Wyoming Game and Fish Department (WGFD) has proposed to conduct a brucellosis vaccination program for elk on the NER (WGFD 2002). As part of the program, they would administer Strain 19 vaccine to elk calves and cows early in the feeding season before extensive exposure to field strain *Brucella abortus* occurs. Each year of the interim program would be conducted in two phases: acclimation and vaccination. If approved, implementation of the proposed action would begin soon after winter feeding is initiated in the winter of 2002-2003. The interim vaccination program would continue through the winter of 2004-2005, unless the record of decision for the NER and Grand Teton National Park Bison (GTNP) and Elk Management Plan Environmental Impact Statement (BEMP EIS) is signed before then, at which time direction provided in the selected alternative of the BEMP EIS would guide brucellosis management on the NER. Vaccination procedures would be carried out as described below.

Feeding Operations. Feeding operations on the NER would continue to be conducted as they have in the past, with the following exceptions. To facilitate the vaccination operation, feedlines would be spaced somewhat further apart than currently practiced. Feedlines would be spaced up to 50 yards apart to provide a maximum shooting range of 25-30 yards when the vaccination team drives the over-the-snow vehicle between feedlines. If any adjustments to the feeding protocol are needed to increase the successful vaccination of calves and cows, the USFWS and WGFD would work together to determine the best course of action. No significant changes to feeding operations would be undertaken. Adjustments would not be made that would adversely affect the elk. Long hay would not be used.

The approval of the WGFD's proposal to vaccinate on the NER would not affect the USFWS's decisions, in cooperation with the WGFD, in a given winter related to (1) when to begin winter feeding, (2) how long feeding is conducted (number of days in a given winter), or (3) whether feeding is carried out or not carried out in a given winter.

Vehicle. The WGFD would use a tracked over-the-snow vehicle (LMC 1500 Beartrac or equivalent) to follow feed trucks during feeding operations to acclimate elk and to provide a vehicle from which to administer the vaccine. The WGFD owns one Beartrac vehicle. If WGFD rents a second oversnow vehicle or secures access to another oversnow vehicle, then two teams would vaccinate elk. The WGFD and USFWS would work together in determining the best vehicle to use. The vehicle combination that disrupts feeding operations the least, disturbs elk the least, and provides the most effective platform to shoot from would be used.

Acclimation. Elk would be allowed to become accustomed to normal winter feeding operations. This would also allow calves to fully participate in the feeding program as they usually require a week to become accustomed to the feeding equipment and routine.

Beginning soon after the onset of supplemental feeding, WGFD technicians would begin to acclimate elk to the presence of the Beartrac vehicle, the two-person team (one to drive the vehicle and one to vaccinate), the report of an air-gun, and other sounds and actions associated with vaccination. Guns (vaccine and paintball) would be dry-fired at varying velocities to acclimate elk to the report of the gun as the support vehicle passes along the feedlines. Devices that sound similar to the vaccination equipment might be used during initiation of the acclimation period.

At the beginning of the acclimation period, acclimation activities would be carried out while feed trucks are dispensing pellets. Ideally, acclimation activities would be performed at two feeding sites each day. As the animals become accustomed to the presence of the support vehicle, two-person team, and the vaccination guns, the vehicles would spend progressively longer amounts of time in the vicinity of the feedlines and closer to the elk. Detailed notes on elk behavior would be recorded during the acclimation process. The acclimation period could require from several hours up to several weeks. Due to the unknown response of elk, the duration of the acclimation period cannot be predicted at this time. The determination of when to cease the acclimation period and begin vaccinating would be somewhat subjective, but would require elk to remain within 50-75 feet of the support vehicle as it passes along a feedline and occasionally comes to a stop.

Vaccination of Elk. Vaccination would begin when the WGFD determines that elk are sufficiently acclimated to the two-person team, additional vehicle, and discharge of firearms and that elk would remain within 50-75 feet of vehicle holding the two-person team. The protocol for vaccination would mimic that for acclimation of elk except that (1) an air-powered biobullet gun would be used to ballistically inject biobullet containing approximately 5.3×10^9 colony-forming units of freeze-dried Strain 19 vaccine, and (2) an air-powered paintball gun would be used to mark each vaccinated animal with an oil-based paint to ensure that it is not vaccinated more than once.

The support vehicle would continue to be operated the same way it was operated during the acclimation period, which includes occasional stops. Ideally, two vaccination teams would be used so that vaccination could be carried out at two or more feeding sites each day. Vaccination would target juvenile elk at each of the four feeding sites, but would also include adult female elk. Adult cow

elk would also be vaccinated to more quickly increase the number of animals in the population that are vaccinated with Strain 19.

During the first few winters of the program, an attempt would be made to vaccinate at least 80% of elk calves, and possibly as many as 50% or more of the adult female elk. This means that approximately 1,200 calves and 2,000 cows (or, a total of about 3,200 elk) would have to be vaccinated each year. The time required to complete vaccination in a given winter cannot be predicted due to the unknown response of elk on the NER. In 2002, the average vaccination time on state feedgrounds was 20 calves per hour (range: 7-57).

Timing and Duration of the Use. The proposed use would be conducted simultaneous with winter feeding activities that generally begin in January or February and continue through April.

Location of the Use. Vaccination of elk would be carried out in the same locations that winter feeding is conducted on the NER, which encompass three habitat types: cultivated fields, grasslands, and sagebrush. Plant communities within these habitat types are described in the environmental assessment. Any changes in elk or bison behavior resulting from vaccination activities or adjustments in winter feeding to accommodate vaccination could also potentially affect vegetation in other habitat types such as riparian and deciduous woodlands (e.g., willow, aspen, and cottonwood) and wet meadows that are found near feeding sites. Riparian and deciduous woodland habitat is currently in a degraded condition due to decades of overbrowsing by elk and more recently by bison.

Besides elk, bison are the only other wildlife species that feed at feedlines. Other wildlife species that can be found in or near feeding areas include coyotes, bald eagles, golden eagles, common ravens, common crows, and black-billed magpies. These species scavenge on elk and bison carcasses. Occasionally, grey wolves visit the NER and have been observed to kill elk.

Typical bird species that nest in riparian and deciduous woodland habitats are Lincoln's sparrows, MacGillivray's warblers, orange-crowned warblers, black- headed grosbeaks, and lazuli buntings. Wet meadows and associated wetlands are important for trumpeter swans, Canada geese, mallards, green-winged teal, gadwalls, American widgeons, common and Barrow's goldeneyes, common mergansers, greater sandhill cranes, and a variety of shorebirds and other birds.

Reason for the Use. The WGFD's purpose in proposing the brucellosis vaccination program is to increase coverage and protection of feedground elk in northwestern Wyoming. The WGFD vaccination program currently is carried out annually on 21 WGFD feedgrounds in northwestern Wyoming. The NER is only one of two winter feedgrounds in Wyoming where elk are not vaccinated. The WGFD believes that vaccinating elk on the NER will enhance immunity and reduce the risk of transmission of brucellosis by reducing abortions caused by brucellosis. Elk overwintering on the NER cannot be vaccinated outside of the NER at this time.

This environmental assessment is being carried out pursuant to the settlement agreement entered into between the USFWS and the State of Wyoming in the case entitled *Wyoming v. United States et al.,* Docket No. 98-CV-037B, which requires the USFWS to perform a compatibility determination and complete an environmental assessment concerning Wyoming's proposed elk vaccination program for the NER.

Availability of Resources:

It is estimated that costs to administer the WGFD interim elk vaccination program would mostly be salaries and that it would increase the cost of the winter feeding program by about 3%, or $2,100. Additional staff time would be spent communicating with WGFD Project Biologists and staff in Cheyenne to ensure close coordination and to work out any disputes, writing and filing out forms related to special use permitting, administering records, monitoring vaccination activities and ensuring that agreed-upon protocol is followed and that stipulations are being met, monitoring elk/bison responses, working with media (in cooperation with WGFD), and providing briefings and updates to regional and Washington offices. Not included in these expenses are the cost of

preparing the environmental assessment, compatibility determination, biological assessment, and any costs that would be needed for travel to Cheyenne, Wyoming to meet with WGFD staff.

Anticipated Impacts of the Use:

The potential impacts of implementing WGFD's brucellosis vaccination program on an interim basis on the NER are described in the *Environmental Assessment for the Implementation of the Wyoming Game and Fish Department's Proposed Interim Brucellosis Vaccination Program for the National Elk Refuge* (USFWS 2002). Depending on pertinence, information from the environmental assessment was either repeated or summarized.

The following assessment of impacts only addresses the direct and indirect effects of the proposed vaccination program and does evaluate in detail the cumulative effects of the proposed program in conjunction with other elk management activities (e.g., winter feeding), as the assessment direct, indirect, and cumulative effects of vaccination and other elk management activities is being done as part of the NER and GTNP bison and elk management plan/EIS process.

Habitat

Although slight alterations may be made to feeding operations to accommodate the vaccination program (e.g., increasing the distance between feedlines), none of the changes would affect cultivated fields, grasslands, and sagebrush habitat where alfalfa pellets would be distributed and where vaccination procedures are conducted. At a maximum, negligible, unmeasurable changes would occur to these habitats.

If vaccination activities cause elk to move away from feedlines more than what they would do in the absence of vaccination, a negligible to minor increase in browsing by elk could take place on the days that elk are disturbed. However, by the end of the feeding season, these potential impacts would be diminished because elk likely consume all or nearly all accessible woody shoots in the vicinity of feedgrounds by the end of the winter feeding season. The condition of woody vegetation close to feedgrounds is already in degraded condition (Anderson 2002, Cole 2002, Dobkin et al. 2002).

Elk Population

Behavior and Social Interactions. Although it is possible that vaccination activities would result in no noticeable changes in elk behavior or interactions, it is more likely that vaccination activities would have at least some affect on elk behavior. However, major recurring or long-lasting impacts would not be anticipated because a stipulation of this compatibility determination is that changes would be made immediately to the vaccination program to avoid this level of impact.

Elk response to an additional vehicle and the activities associated with vaccination (e.g., starting and stopping of the vaccination vehicle, firing air guns) could vary on a daily basis, from negligible effects to elk leaving the vicinity of the feeding area where vaccination is taking place. Negligible and minor level effects would include animals flinching after being hit by a biobullet or paintball or in response to other activities associated with vaccination, a small numbers of animals rushing away from the feedline soon followed by a return to the feedline, and minor scuffling among elk. These types of effects would be expected to be normal and regular occurrences during the vaccination period.

Occasionally, major, short-duration effects could result from the presence or stopping and starting of the oversnow vaccination vehicle, changes in the vaccination vehicle relative to the feed trucks (e.g., increased distance between the two), human movements, the firing of air guns, being hit with a biobullet or paintball, and the sight of one or more elk being slightly alarmed in response to these stimuli. Major effects include the movement of large numbers or all animals away from a particular feeding area, escalated aggression among elk that leads to fighting resulting in serious injury or

death, and aggressive interactions between elk and bison (B. Smith, Wildl. Biologist, NER, pers. comm., 2002). Increased aggression could occur if elk from one part of a feedline quickly move away and then converge on another part of the feedline already occupied by elk.

It is not anticipated that the additional time would be added to the process of dispensing alfalfa pellets. This is because substantial increases in the amount of time it takes to dispense alfalfa pellets could result in increased aggression among elk and increased aggression could escalate to major, short-duration effects such as fighting among some elk. Such fighting could potentially lead to injuries or death.

Effects of Brucellosis in Elk. Strain 19 would provide some level of protection against brucellosis-induced abortion and infection in elk (Thorne et al., 1981, Herriges et al., 1989, Roffe et al. 2002) and could potentially result in a slight, likely unmeasurable reduction in seroprevalence of brucellosis in NER elk following a few years of vaccination (e.g., 3 years). It is also possible that other factors influencing seroprevalence could result in an increase in seroprevalence during this time (B. Smith, Wildl. Biologist, NER, pers. comm., 2002). The environmental assessment provides details on research conducted on Strain 19, but a summation of implications to the NER are as follows:

> Assuming that (1) 80% of calves are successfully vaccinated, (2) none of the calves have had previous exposure to *Brucella* organisms, and (3) a 25% efficacy with respect to protection against abortion, Strain 19 may result in 20% of NER calves being protected against abortion related to brucellosis. If 50% of the calves are successfully vaccinated, this would result in an estimated 13% of the calves being protected against infection and abortion. In 1989-1991, 45% of NER calves were hit by Strain 19 biobullets.
>
> Assuming that (1) 50% of all NER cows are successfully vaccinated, (2) 73% of adult cow elk had not been previously exposed to *Brucella* organisms (assuming that 27% of the cows are already infected, based on the 10-year average 27% seroprevalence rate) and (3) a 25-30% efficacy with respect to protection against infection and abortion, Strain 19 may result in 9-11% of NER cows being protected against infection and abortion related to brucellosis. If only 25% of the cows are vaccinated, this would result in an estimated 5-6% of the cows being protected against infection and abortion. In 1989-1991, 4% of NER cows were hit by Strain 19 biobullets.

There are a number of assumptions listed in the environmental assessment with respect to assumption ‘3' in both paragraphs above, and if these assumptions are not met, efficacy of Strain 19 in field conditions may be higher or lower than clinically measured efficacy.

Even if the proposed vaccination program resulted in measurably lower levels of seroprevalence of brucellosis in NER elk, this must be considered in the context of how vaccination-induced reductions in seroprevalence relate to the mission of the NWRS. Brucellosis is not a problem biologically to elk overwintering on the NER (Smith and Robbins 1994). Brucellosis in elk is primarily of concern because of potential for transmission of brucellosis from elk to livestock (Smith and Robbins 1994, Smith 2001, Ragan 2002, Thorne et al. 2002). While brucellosis may not be a biologically significant problem to elk wintering on the NER, the high prevalence of brucellosis in NER elk is an indicator that the conditions experienced by these elk are optimum for the transmission of other, more pathogenic diseases (Smith 2001). As such, reducing the seroprevalence of brucellosis in elk through vaccination, without addressing factors that cause elevated levels of brucellosis, does not necessarily contribute to the mission of the NWRS mission because it does not address the underlying problems that allow the disease to flourish. These underlying problems were investigated in a problem analysis that was conducted by the BEMP EIS interagency working group (DeLong 2001).

Mortality, Calf Production, and Numbers of Elk. It is possible that the incidence of gorings by bull elk or bison could increase slightly above the current level. Although not anticipated, it is possible that a small number of fatalities could result from disturbances described in the previous section and from elk cows and calves being hit with biobullet. Of the 2,272 elk that were vaccinated during 1989-1991,

only 2-5 (less than 0.2%) may have died due to complications associated with biobullet vaccination (Wilbrecht 1989). It is not anticipated that the administration of Strain 19 would make elk more susceptible to predation or other causes of mortality, aside from factors described above. Therefore, any increases in mortality would be minimal.

Assuming that 100% of calves and cows have been vaccinated by the third year of the vaccination program and that Strain 19 is 25% effective in calves vaccinated on the NER, it is estimated that up to 10 additional calves would be recruited into the February population that year and up to 34 fewer abortions would occur that year (see the environmental assessment for details on how the estimates were calculated and for assumptions). If fewer than 100% of the calves are vaccinated, proportionally fewer calves would be recruited into the February population. Thorne et al. (1978) and Herriges et al. (1989) reported that 50-70% of cow elk infected with brucellosis loose their first calf. After aborting the first calf, calf production is not affected appreciably (Thorne et al. 2002). This means that the effects of vaccinating elk on the NER 2003-2005, in terms of impacts on calf production, would occur during 2005-2007, assuming that female elk are first bred at age 2-1/2 and capable of producing their first calf at 3 years of age (Smith and Robbins 1994). An additional 10 calves being recruited into the February population each year would have negligible effects on the population (e.g., less than a 0.1% increase each year).

Other Wildlife Species

The following assessment of potential effects on other wildlife species is done as a group, except for potential disturbance effects on bison, because potential habitat and biosafety effects are similar among groups of species.

Disturbance to Bison. Vaccination procedures, including the use of an additional vehicle, firing air guns, and the effects this has on elk could result in behavior changes in bison, ranging from negligible to major, short-duration impacts. When calf and cow elk are being vaccinated on feedlines that are also occupied by bison, bison could become startled by the starting and stopping of the vaccination vehicle, report of the air gun, reactions of elk to these factors or to being hit with a biobullet or paintball, or other movements and sounds. It is anticipated that, in most instances, bison that are disturbed would immediately resume feeding. However, it is possible that on occasion the disturbance might elicit a flight response in bison, especially during the acclimation period. The most severe response would be for small to large numbers of bison to leave a feeding area temporarily or it is possible that they may move to another feeding area (B. Smith, Wildl. Biologist, NER, pers. comm., 2002).

During the last several years, bison on the NER have been approached with a Thoikol (oversnow vehicle) and, because some bison have been shot with tranquilizer guns, many bison now appear to associate the Thoikol with danger. In many cases, the approach of a Thoikol elicits a flight response in bison (B. Smith, Wildl. Biologist, NER, pers. comm., 2002). This may make it difficult for similar oversnow vehicles, such as the one proposed for use by WGFD in vaccination activities, to approach feeding areas occupied by bison without having bison run away. Because bison reaction to the oversnow vaccination vehicle could elicit a response in elk, this could add to the acclimation period on one or two feeding areas.

Effects due to Habitat Alterations. Because implementation of the proposed vaccination program on an interim basis would likely not result in any measurable or noticeable changes to habitat conditions (see discussion on habitat impacts, above), no changes in population levels, densities, productivity, or other parameters of ungulate, bird, predator, and scavenger species would be anticipated due to possibly slight alterations to habitat conditions.

Effects due to Changes in Elk and Bison Distribution and Mortality. Because the Proposed Action would have negligible lasting effects on elk and bison distribution — the vaccination program would be changed before this happened — any changes in distribution would not be large enough to result

in anything more than negligible effects on wildlife species that could be affected by changes in distribution.

As noted in the Elk Population section, vaccination activities and possible adjustments to winter feeding operations could potentially cause elk and/or bison to move from one feeding area to adjoining habitat (temporarily) or to another feeding area. However, changes would be made to the Proposed Action to minimize the extent to which any such disturbances recur. Furthermore, NER staff would immediately move a portion of the animals from the feeding area that gained animals to the feeding area that lost animals (i.e., any changes in distribution would be temporary).

The negligible to minor increase in mortality, due to such things as gorings by bull elk and bison and mortality caused by complications resulting from biobullets, would add to the food base of scavengers such as coyotes, bald and golden eagles, common ravens, common crows, and black-billed magpies. Because the mortality rate on the NER is relatively low (e.g., an average of about 1½%), even a slight increase in elk carcasses would noticeably add to the food base of scavengers. Conversely, the number of aborted fetuses would decline for a period of 3-4 years, but this would be a negligible impact. No lasting measurable effects would be anticipated due to potential changes in the mortality rate of elk on the NER.

Likewise, the anticipated negligible increases in calf recruitment and population growth would have no measurable effect on the food base of wolves, grizzly bears, and mountain lions in other parts of the Jackson elk herd unit.

Safety of Strain 19 in Wildlife other than Elk. Roffe and Olsen (2002:53) noted that "Despite the fact that S19 has been widely used in bison, very little research has been done on biosafety of this vaccine in bison and non-targeted wildlife species. Nevertheless, S19 vaccine was used extensively in calves and there were no widespread reports of adverse effects from commercial bison producers." Cook and Rhyan (2002:63) noted that "No clinical trials have been conducted specifically examining the safety of S19 in non-target wildlife. However, field experience suggests that S19 is safe in many species of non-target wildlife" (see environmental assessment for more detail).

Threatened, Endangered, and Sensitive Species

The effects of the Proposed Action on the most likely threatened and endangered species to be affected (e.g., grey wolves and grizzly bears) have already been described (see the previous section, Other Wildlife Species). The Proposed Action would have negligible, if any, effects on threatened, endangered, and sensitive species as a consequence of temporary changes in elk and bison distributions, negligible changes in calf recruitment and mortality rates. No adverse effects of using Strain 19 to vaccinate elk, bison, and cattle on wolves or grizzly bears or other threatened species have been reported.

Biological Diversity and Biotic Integrity

Because the negligible to minor effects that the Proposed Action would have on elk and other wildlife species, which would translate to negligible if any effects on population sizes, disease prevalence in NER elk, and long-lasting changes in habitat use and distribution, there would not be any measurable effects on biological diversity or biotic integrity on the NER and surrounding lands.

One exception to this is that vaccinating elk using *Brucella abortus* Strain 19 would increase the prevelance (relative abundance) of this strain of an exotic species in the NER area. However, because elk in the Gros Ventre River drainage and areas south of Jackson are being vaccinated annually with Strain 19, this strain of *Brucella aborta* is already prevalent in elk of the Jackson herd unit.

Wildlife-Dependent Recreational Opportunities on the NER Associated with Elk

The vaccination of elk would not begin until well after the close of the hunting season for elk on the NER. Therefore, any temporary shifts in distribution resulting from vaccination activities would not affect hunting opportunities. Effects of the vaccine program on calf production and recruitment could have negligible, if any, effects on NER hunting opportunities. Likewise, viewing opportunities during most of the year would not be measurably affected.

If vaccination activities do not result in elk vacating the Nowlin feeding area, potential effects on NER sleigh rides would be nonexistent to minor, except that (1) vaccination activities at the Nowlin feeding area could provide morning sleigh ride participants an opportunity to be educated about brucellosis in the Greater Yellowstone area and WGFD's brucellosis management program and, conversely, (2) large numbers of calves and cows marked with paint could detract from the viewing experience and photographic opportunities for some people, especially since elk are viewed and photographed at close range from sleighs.

If large numbers or all elk using the Nowlin feeding area vacate the area due to vaccination activities or adjustments to feeding protocol, sleigh ride operations would stop for the day. This would reduce viewing opportunities for people visiting Jackson Hole on that particular day, would result in fewer opportunities for the NER to educate visitors about elk and wildlife conservation. Assuming that an average of 225 visitors ride the sleighs each day (J. Griffin, Assistant Refuge Manager, NER, pers. comm., 2002), each day that the sleigh rides are not in operation means that an estimated 225 fewer visitors would have the chance to ride the sleighs, view elk at close range, and to be educated about elk and wildlife conservation. Furthermore, each day that the sleigh rides are not operated results in a loss of an estimated $3,000 to the sleigh rider operator, NER, and the National Museum of Wildlife Art, including an estimated $1,800 loss to the sleigh ride operator. These costs are not recoverable. During the last five years, an average of 24,367 people participated in sleigh rides each winter. If elk are disturbed on feeding areas due to vaccination procedures to the extent that they leave the area, changes would be made to vaccination procedures to ensure it does not continue. Therefore, impacts on sleigh ride operations would be minor.

If elk are alarmed on the Nowlin feeding area, due to vaccination activities, while horse-drawn sleighs are in the vicinity of the elk, horses could panic in turn, which is a safety issue for visitors.

Cumulative Effects. The proposed use would not contribute or add measurably to the degradation of habitat or disease risks caused by related programs such as winter feeding on the NER. Therefore, the cumulative effects of the proposed use would be negligible.

Public Review and Comment:

Public review of the draft compatibility determination will coincide with public review of the accompanying environmental assessment, and a summary of related comments and how they were addressed will be included in this section of the final compatibility determination.

Determination:

This use has been found compatible/not compatible.

Stipulations Necessary to Ensure Compatibility:

The following stipulations would allow the proposed use to be compatible from the standpoint of direct and short-term effects on the ability of the USFWS to fulfill the NWRS mission and the purposes of the refuge.

- Elk vaccination teams will monitor and record response to vaccination procedures daily. Likewise, feed truck drivers will monitor elk behavior as is standard protocol at the NER. Observations of both groups will be used to make adjustments to avoid major adverse effects on elk, other wildlife, and opportunities for wildlife-dependent recreation.

- After a few days of acclimation, if elk repeatedly rush away from feedlines each time the airgun is fired, even if they return shortly, changes to vaccination procedures would be required to remedy this problem. Occasional reactions of elk resulting in them rushing away from the feedline would be acceptable.

- If, while vaccination activities are occurring, elk leave a feeding area and do not return until the next day or move to another feeding area, changes would be made to vaccination procedures to avoid recurrence of this response. If attempts to correct the problem do not prevent elk from leaving feeding areas, the vaccination program would be discontinued at the feeding sites where this is occurring.

- If, while vaccination activities are occurring, interactions between elk or between elk and bison increase above interactions of past years, and if interactions lead to injuries or death, changes would be made to vaccination procedures to avoid recurrence of this response. If attempts to correct the problem do not prevent further serious injuries or death, the vaccination program would be discontinued.

- Winter feeding operations would not be altered to any measurable degree to accommodate the proposed use, as the feeding program has evolved over the last 30 years to minimize adverse interactions among elk. This includes no significant increases in the amount of time spent dispensing pellets. Changes in the way alfalfa pellets are dispensed could result in increased interactions, which could lead to injuries and death of elk.

- The decision to initiate winter feeding would not be influenced by the proposed use. If the criteria upon which the decision is made (USFWS and WGFD 1974) dictate that feeding is not needed in a given year, feeding would not be initiated for the purpose of allowing vaccination to occur. On average, winter feeding has occurred 9 of 10 years since 1912, and it has occurred each of the last 20 years.

- Hay would not be used.

Justification:

The proposed used was determined to be compatible for the following reasons. The potential effects of the proposed vaccination program, to be implemented for an anticipated 3 years, would result in negligible to minor direct and indirect effects on elk and other wildlife and opportunities for wildlife-dependent recreation. Any effects of the proposed use (both beneficial and adverse) would be so slight that they would not be measurable, assuming adherence to the stipulations identified above. Therefore, while it would not contribute to the accomplishment of refuge purposes or the mission of the NWRS, vaccinating elk on the NER for a short period would not hinder their accomplishment.

Although vaccination of elk, under current technologies, can only be effectively undertaken when elk are concentrated through a winter feeding program (Thorne and Kreeger 2002, WGFD 2002), implementation of the proposed use for an estimated 3 years would not have any influence on the continuation of winter feeding during this period. Therefore, although winter feeding is a prerequisite of the proposed use and although winter feeding has resulted in adverse impacts to wildlife habitat (Anderson 2002, Cole 2002, Dobkin et al. 2002) and disease prevalence and risk (Thorne et al. 1978, 1997; Smith 2001) on the NER, implementing the proposed use for the next 3 years would not be responsible, in whole or in part, for perpetuating these effects because (1) winter feeding would continue to be carried for the next few years regardless of whether vaccination occurs, and (2) the proposed use would not worsen, to any measurable degree, any of the adverse effects associated with winter feeding.

The long-term effects of Strain 19 vaccination, cumulative with the effects of long-term winter feeding and other management activities, are being evaluated in the BEMP EIS. While the USFWS recognizes the concern by some stakeholders that implementation of a short-term Strain 19 vaccination program on the NER will greatly increase the chances that Strain 19 vaccination and an accompanying winter feeding program will be selected for implementation in the BEMP EIS process (as explained in the environmental assessment), the USFWS is committed to ensuring that the implementation of the proposed use for the next few years will have no bearing on the decision in the BEMP EIS, other than providing additional information to make an informed decision.

USFWS policy requires that compatibility be based on “sound professional judgement,” meaning that determinations must be consistent with “sound fish and wildlife management.” However, in making compatibility determinations, the consideration of sound professional judgement and consistency with sound wildlife management is narrowly limited to the determination of whether a proposed use would or would not “materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge” (16 USC 668ee). The determination of compatibility in this document is consistent with sound wildlife management, as is demonstrated in the analysis of impacts in this compatibility determination and the environmental assessment.

Compatibility Determination

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)

__n/a*__ Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

* The proposed use will be implemented for less than 5 years.

NEPA Compliance for Refuge Use Decision (check one below):

___ Categorical Exclusion without Environmental Action Statement

___ Categorical Exclusion and Environmental Action Statement

_X_ Environmental Assessment and Finding of No Significant Impact

__ Environmental Impact Statement and Record of Decision

Determination

Prepared by: _____ _____
(Signature) (Date)

Regional Director: _____ _____
(Signature) (Date)

Concurrence

Refuge Supervisor: _____ _____
(Signature) (Date)

Regional Chief, National Wildlife Refuge System: _____ _____
(Signature) (Date)

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